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THE

MISCELLANEOUS DOCUMENTS

OF THE

HOUSE OF REPRESENTATIVES

FOR THE

FIRST SESSION OF THE FIFTY-SECOND CONGRESS,

1891-'92.

IN FIFTY-THREE VOLUMES.

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SPECIAL CONSULAR REPORTS.

COAL AND COAL CONSUMPTION

IN

SPANISH AMERICA.

REPORTS FROM THE CONSULS OF THE UNITED STATES ON THE COAL DEPOSITS AND COAL CONSUMPTION IN THEIR SEVERAL DISTRICTS, IN ANSWER TO A CIRCULAR FROM THE DEPARTMENT OF STATE.

ISSUED FROM THE BUREAU OF STATISTICS, DEPARTMENT OF STATE.

ALL REQUESTS FOR THESE REPORTS SHOULD BE ADDRESSED TO THE SECRETARY OF STATE.

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1891.

COAL AND COAL CONSUMPTION IN SPANISH AMERICA.

MEXICO.

CHIHUAHUA.

REPORT BY CONSUL HEIMKÉ.

The coal consumed in my consular district is received principally from Trinidad (Colorado), Cerrillos (New Mexico), and McAlester (Indian Territory). A small quantity, on account of its inferiority, as compared with American coal, comes here from Sabinas, State of Coahuila, Mexico. The kind of coal consumed is all bituminous, and the quantity will average about 2,500 tons monthly. The price at the mines is said to be about $3 per ton; at the place of export (El Paso), about $7 per ton, and at points of delivery (principally Chihuahua), about $14 per ton—the latter in Mexican silver ($13.02 American).

On account of the entire absence of coal fields in this State, American producers stand in no danger of competition, even from the native coal fields of Coahuila. The trade can be extended at the present time only by or through a reduction in railroad freight rates, which are excessively high. The governor of the State of Coahuila has offered $25,000 as a reward to anyone who may discover coal in this State; but thus far no coal has been found.

WM. HEIMKÉ,
Consul.

UNITED STATES CONSULATE,
Chihuahua, October 16, 1890.

GUAYMAS.

REPORT BY CONSUL WILLARD.

IMPORTED COAL.

The consumption of coal in this consular district (Guaymas) is confined principally to the Sonora Railway Company, which imports it from the United States for railway service and for use at their machine shops.

The company also sells coal, but to a limited extent, to the coast

steamers when needed. The amount imported during the past year, according to the figures given me by the company, was 3,480 tons from Blossburg, N. Mex., where it is mined and delivered on the cars. It costs delivered at Guaymas $12.50 per ton, and the price when sold at this port is from $14 to $15 per ton.

The Sonora Railway uses wood to a great extent for their train locomotives.

The importations by sea of coal is confined to small lots or shipments that come as ballast in European merchant vessels, in 40, 50, and 80 ton lots. The aggregate during the year will not exceed 350 tons, and it is sold at from $10 to $12 a ton as a rule to the head lighterman of the port for the use of the steam tugboat in the harbor. No vessel has entered this harbor for the past two years bringing full cargo of coals.

Steam vessels engaged in trade at this port obtain their coal outside of this consular district, viz:

The Pacific Coast Steamship Company's steamers of San Francisco make monthly voyages to this port and other coast ports of Mexico from San Francisco, carrying sufficient coal (from the home port) to last the round voyage.

The Mexican Coast Line steamers, making semimonthly voyages to the Mexican ports of Manzanillo, San Blas, Mazatlan, Altata, La Paz, and Guaymas, are supplied from the coal depot of the owners of the line at Mazatlan (consular district of Mazatlan), but has during the past year occasionally purchased coal at this port from the Sonora Railroad Company, but the amount will not exceed 300 tons during the year.

The small Mexican supply steamer of the guano islands of Raza and San Pedro, on the Lower California coast, consumes from 20 to 25 tons per month, or 300 tons per annum (more or less), which is purchased from the Sonora Railroad Company or merchant vessels.

The supply steamer of the Copper Mining Company of "Boleo," at the port of Santa Rosalia, Lower California, that makes weekly trips to Guaymas, is supplied with coal from Santa Rosalia, brought by vessels direct from Europe to that port. The small Mexican merchant steamers (two of about 80 tons each) that make irregular voyages to this port from Mexican ports south are supplied by coal from Mazatlan.

From the foregoing statement the amount of coal consumed and supplied from this port will not exceed 3,100 tons, and nearly all imported from the United States. The fuel used for steam machinery in operation in various parts of the district is wood, which is becoming scarce in many places.

GUAYMAS COAL MEASURES.

Coal has been found in various localities of this consular district, and it belongs exclusively to the anthracite variety. The extent of the Coal "Measure" is not as yet well known. The coal discovered nearest this port is at or near the town of San Marcial, 60 miles distant, and from

that point to the Yaqui, easterly 60 miles, coal and the indications of coal exist.

A company was formed in England under the name of the "Mexican Explorations, Limited," within the past two years to explore and test that portion of the country for coal, but owing to some difficulty with the owners of the concession (granted by the Mexican Government) exploration work was not commenced, although machinery was brought into the country for that purpose. The Mexican owners of the concession are now exploring that portion of the country which embraces a superficial area of 60 by 30 miles approximate.

The deposits or "measures," which have to a small extent been developed and worked, are situated at or near the mining towns of Los Bronces and La Barranca, 120 miles northeast from Guaymas. This coal has been used by the mining companies at said places for the last twenty years for their steam works.

Reports made on the Coal Measures in those places by competent experts state that the coals are of good quality and are extensive, the seams being from 6 to 12 feet in thickness (no coal has been found of a bituminous character), and that it gives from 80 to 94 per cent of fixed carbon. It has a peculiar color resembling somewhat steel, and I am told can be mined for $1 per ton, silver.

A railway has been projected for some years to these coal fields, and it is confidently expected that this year the work of construction will be commenced; the road will pass over a country with easy grades from 15 to 20 feet to the mile. The demand for this class of coal on the Pacific coast is increasing, and all that is needed to make it a leading article of commercial importance is cheap transportation to the coast for a market. The cost of transportation by wagon or pack mules to the coast prevents it from being utilized, up to the present time, for traffic and trade purposes as an article of export.

A. WILLARD,
Consul.

UNITED STATES CONSULATE,
Guaymas, Mexico, September 12, 1890.

MEXICO.

REPORT OF CONSUL-GENERAL GUENTHER.

The scientific commission appointed by the Government in 1881 for the purpose of exploring the regions where the presence of coal is indicated, have established the existence of important coal deposits in the States of Puebla and Vera Cruz.

There are also deposits in northern Mexico, in the States of Sonora, Chihuahua, and Coahuila. In Guerrero, Ojaca, Tlaxcala, and Michoacan, there undoubtedly exists coal also, but no explorations of any ex-

tent have been made. The most important coal deposits are those of Sonora, Puebla, and Coahuila. The following is an analysis of the coal from "San Felipe" and "Del Alamo," in the State of Coahuila, compared with coals from the United States and England.

	Coal from the United States in use on steamboats.	Anthracite from Pennsylvania.	Black bituminous coal used by Mexican railroads.	Coal from San Felipe.	Coal from Del Alamo.
Water	1.35	2.30	2.50	.80	1.77
Volatile and combustible matter	37.45	5.20	15.00	13.32	13.86
Fixed carbon	57.40	80.95	18.30	73.02	60.45
Ashes	3.80	11.55	4.20	12.80	23.92

The caloric power of the coal from San Felipe is 82.4 per cent, and of the coal from El Alamo 69.1 per cent.

Of the Mexican coals so far known only those of the great coal deposits of Sonora and of Tecomatlan, in the State of Puebla, can be compared with those of Cohahuila.

The following telegram, which appeared in the Two Republics of this city, under date of October 21, will be of interest on this subject of coal in Mexico.

TUCSON, ARIZ., *October* 20.—A special inspector of the Mexican Government telegraphed here to interested parties that a large body of anthracite coal has been struck at the depth of 8 feet in Sonora. This is important, as all coal used by railroads in this section and city is hauled 500 miles.

In regard to the price and the kind and quantity of coal consumed: Nearly all the coal consumed in Mexico is imported from the United States, the Mexican coal used coming from the mines of Cohahuila which comprise some 20,000 acres. This coal as yet is not mined to any great extent, owing to the facilities for mining the same not being very great. The cost of mining this coal, or the price at the mines, is $1.25, and the cost at the city of Mexico $15 per ton. The United States exported to Mexico during the year 1888 (the latest statistics which I have at hand) 1,877 tons of anthracite coal, value $7,281; bituminous 30,251 tons, value $142,354. The greater part of the coal coming from the United States, I am informed, is from the McAllister mines, in the Indian Territory, and the anthracite, of which very little is used, from West Virginia and Pennsylvania. The railroads in this section of Mexico find it cheaper or better to use wood instead of coal on their roads, with the exception of the Mexican or Vera Cruz road, which gets its coal from England. It is patent coal, made from coal dust, oil, etc. Bituminous coal from the United States costs in Vera Cruz, I am informed, $13 per ton, and the coal from the Indian Territory and Texas, delivered here (bituminous), $17 per ton.

RICHARD GUENTHER,
Consul-General.

UNITED STATES CONSULATE-GENERAL,
City of Mexico, December 10, 1890.

NOGALES.

REPORT BY CONSUL SMITH.

The coal consumed in this district is obtained from the United States, chiefly at Blossburg, New Mexico, and is anthracite. The Sonora Railroad is the principal consumer, but small lots for blacksmithing purposes have been sold here at $12.50 per ton.

The fuel used in this consular district for house-heating purposes, etc., is wood, which is procured in the vicinity, and for a portion of the distance between this place and Guaymas the railroad company uses wood in running their engines.

From figures kindly furnished me by the Mexican consul at Nogales, Ariz., I am informed that 5,381,000 pounds of this coal passed into Sonora through this port during the last fiscal year, valued at $14,467. This would make the price of a ton of 2,240 pounds a trifle over $6 at this place.

Coal is now being prospected for at or near San Marcial, Sonora, and it is believed that it will develop into extensive coal fields. The location is about 75 miles east of north from Guaymas and about the same distance south of east from Hermosillo, and it is said that this coal belt extends nearly north to the vicinity of the Arizona line north of Fronteras, Sonora.

It is quite probable that a large coal belt well be opened up there in the near future, and it is among the possibilities that a railroad to tap this belt will be built from Wilcox, a point in Cochise County, Ariz., on the Southern Pacific Railroad. Indications of coal have been found in the Chiricahua Mountains, in Arizona, at a point about 40 miles east from Wilcox. Between the two parallels 32 and 34, at Fort Apache, Ariz., coal is found. Proceeding farther north to Evanston, Wyo., coal is again found, which would seem to indicate that there is a coal belt running north from near the Gulf of California between these parallels to Wyoming at least. The contemplated outlet for these San Marcial coal fields is Guaymas, from which point to the fields a railroad can be built over a comparatively easy grade, and in the event of success, the various industries of the country will advance, and southern California (San Diego and Los Angeles) will be able to get fuel at a very much reduced rate, the high price of which now is the great drawback to enterprises that should flourish there.

I inclose herewith clippings relative to the discovery at San Marcial, Sonora.

DELOS H. SMITH,
Consul.

UNITED STATES CONSULATE,
Nogales, October 25, 1890.

[Inclosures in Consul Smith's report.]

GOOD REPORT.—A SIX-FOOT VEIN OF COAL HAS BEEN STRUCK.

Col. Francisco Garcia, of San Marcial, is in the city, and yesterday he received a telegram of congratulation from Col. Belton, who was officially detailed by the Mexican Government to report as to the progress made in the San Marcial coal fields, Sonora, Mexico. Col. Belton telegraphed that a 6-foot vein of the finest grade of anthracite coal had been struck at 17 feet, and that they are now at 80 feet in a solid seam of anthracite, in which they have gone down 6 feet without going through. At this point the diamonds came out of the drill, and work will be delayed till repairs can be made.

This report, coming as it does from this official authority, must be taken as meaning a great deal for this section. It will completely revolutionize business through the Southwest, and by cheapening fuel add a new impetus to our mining industries. With the opening of such a quality and quantity of fuel it is difficult indeed to foresee how much the country is to be benefited.

SONORA MINES.

[Nogales Record.]

Last week Mr. Joe Lusignan arrived from La Baranca, Sonora, where he has been for several years past. From him we learn that during the month of August the La Baranca mine, owned by Mr. Graff, of Germany, produced 42 bars of bullion, valued at $1,000 a bar. The La Dura mine, under the management of Mr. Fred Hartman, is proving an excellent proposition, shipping 500 to 600 tons per month, mostly to Denver. Mr. Price, general manager of the Minas Prietas, the owner of the Rosario mine, near La Mesa, is now working a large force of men running a 600-foot tunnel. Mr. J. W. Goodman, chief engineer of the Minas Prietas, also has a mine, the Providencia, near La Mesa, and is working 20 men with good results. La Mesa is located about 40 miles east of Onavas, on the east side of the Yaqui River. The Portuguese, a new mine, located about 14 miles from La Baranca, and owned by Manuel Johnson and Manuel Rochas, is showing up a bonanza, and it is claimed that the ore will exceed in richness that of any other mine in that section of country. Capt. Dwire, representing the English company that purchased six months ago the Santa Clara coal fields from N. Graff, is expected to arrive here to make the second payment of $90,000. The first payment was $10,000, with $90,000 in six months and $100,000 in one year.

NUEVO LAREDO.

REPORT BY CONSUL-GENERAL SUTTON.

The coal consumed in this consular district is obtained from the Indian Territory and from Laredo, Tex. (Santo Tomas coal mines, 25 miles up river). The imports for the year ending June 30, 1890, were 45,750 long tons—3,100 carloads on narrow-gauge cars. About 30,000 tons of the above came from the Indian Territory, and is worth on the Laredo, Tex., side about $7.20 per ton, United States coin. The other 15,000 tons is the Laredo, Tex. (Santo Tomas mine), coal, and is worth in Laredo, Tex., from $4.10 to $4.40 per ton, United States coin. All these imports of coal are for railroads, mining, and manufacturing enterprises to the south; none is used in this city except on the railways. Miners have

to use the Indian Territory coal, as the Laredo, Tex., coal is not good enough. The present rates for this Laredo coal are: In Monterey, $9, Mexican coin; San Luis Potosi, $12.50; and in the City of Mexico, $13.50. The great expense from here south is in the freight, which is $7.50 to San Luis Potosi and $8.40 to Mexico City, per ton of 1,000 kilos.

Coal is imported into Mexico at every point except Piedras Negras. At that point the Sabinas (Coahuila) coal fields supply the local demand and the railroads and other industries to the south tributary thereto, and also export a considerable quantity to the United States, some 45,000 tons for the fiscal ending June 30, 1890. The Laredo, Tex., coal and the Sabinas coal are more or less of the same class or value, and in quality are much below the coal from the Indian Territory.

The importation for this consular district is for account of the railroads operating in the interior, or on orders from mining and other enterprises through brokers in this city. Coal is carried in the United States to the border by rail and from here to destination by the Mexican National Railway Company and connecting lines.

The Laredo, Tex., coal is found on the bank of the river, and these fields must, in my opinion, be also found on the Mexican side, but so far this has not been determined. Below here, at Guerrero, is a fair quality of coal on the Mexican side, which would be mined considerably if a railroad passed near by, but which is not sufficiently valuable to warrant the building of a road to it.

At Nogales the coal imports are from New Mexico and the Pacific coast, about 2,500 tons for the fiscal year 1890; at Paso del Norte from Colorado, New Mexico, and the Indian Territory. The price in Paso del Norte is from $7 to $8 per ton, of which about three-quarters represent freight. Over 90,000 tons and 5,000 tons of coke were imported at Paso del Norte in the fiscal year 1890.

As I have stated, no coal is imported at Piedras Negras and the imports here are from the Indian Territory and Laredo.

The imports at Vera Cruz were about 6,000 tons from England and 2,000 from the United States. I have not the data at hand for Tampico, but the import, if any, was very small. But so soon as the harbor company succeeds in getting from 10 to 12 feet of water on the bar they will be able to bring in Alabama coal at from $5 to $7 per ton. When the Monterey and Mexican Gulf Road is built through to Tampico there will be two railroads to use this coal and to carry it along their lines where needed for manufacturing. This is likely to be a very important outlet for our coal and our manufacturers in that region should be ready to take advantage of this market at the earliest possible moment.

There are many persons all over Mexico prospecting for good coal fields; so far these have not been found; if found, they would make a commercial revolution in this country. The best coal so far found in

Mexico is that in the Sabinas coal fields, as to which Consul Fechét, of Piedras Negras, has made several interesting reports.

WARNER P. SUTTON,
Consul-General.

UNITED STATES CONSULATE-GENERAL,
Nuevo Laredo, Mexico, September 8, 1890.

PASO DEL NORTE.

REPORT BY CONSUL SAMPSON.

There are no means whereby I can secure the number of tons of coal consumed in this consular district, but I can give information as to the amount coming into it at this port, a very large proportion of which passes south on the Mexican Central Railroad, or is consumed by that road. For the fiscal year ending June 30, 1890, there were about 94,000 tons of coal and 6,000 tons of coke imported into this city. It comes from Trinidad, Colo., Cerrillos and Raton, N. Mex., and McAllister, Ind. T. The price in this city is $7.50, nearly $5 of which represents freight, etc.

The business is conducted by Americans altogether and the bulk of the coal consumed, outside of that used by the railroad, is consumed by Americans residing in Mexico.

There are no known coal fields in this consular district, nor on the line of the Mexican Central Railroad between here and City of Mexico.

Parties are now prospecting and hope to find coal near this city.

A. J. SAMPSON,
Consul.

UNITED STATES CONSULATE,
Paso del Norte, Mexico, September, 1890.

PIEDRAS NEGRAS.

REPORT BY CONSUL FECHÉT.

The port of Piedras Negras is the only port in Mexico, and, I believe, in all Spanish America, that exports coal instead of importing it.

To supplement my report on the Coal Measures of Coahuila (Consular Reports, No. 113, February 1890), I began in June last to collect coal import data for Mexican ports, and, through the courtesy of our consuls, I have collected data for all chief ports save Tampico and Progreso (Merida).

This tonnage data is embraced in the inclosure marked No. 1.

I shall now address myself to the inquiries in coal circular of August 15, 1890.

The coal consumed in this consular district is entirely produced from the Sabinas coal mines, situated in the district. Mines are owned and operated by the Coahuila Coal Company and Alamo Coal Company. Annual output about 10,000 tons. These companies have erected 30 coke ovens, with a daily capacity of 1 ton of coke per oven each day. This coal yields by weight 62 per cent of coke.

The consumption of coal in this district, and in Mexico as well, outside of the railroads is small; the Sabinas coal companies, however, encounter no difficulty in marketing their output, as the demand exceeds the supply; to more fully meet the demand these companies are rapidly pushing development work. These companies have about 51 square leagues of coal lands. For the fiscal year ending June 30, 1889, there were exported to the United States at this port 87,769 long tons of Sabinas coal, and for year ending June 30, 1890, 44,996 long tons, invoiced at $4.06 Mexican silver per ton.

As only the excess over home consumption is exported, the decreased tonnage exported is due to increased home demand, chiefly from railroads. This coal is sold to the Mexican International, Mexican Central, and Monterey and Gulf roads, and also largely supplies the local demands of the City of Mexico, San Luis Potosi, and other large cities that can be reached by all rail routes.

The Sabinas coal fields extend to the Rio Grande Valley and across into Texas. (See Coahuila Coal Measures in Consular Reports, No. 113, February, 1890.)*

A company composed of French and Mexican capitalists have acquired a large acreage of coal lands but 5 miles from Piedras Negras and less than 3 miles from the line of the Mexican International Railroad, and are now making extensive developments to secure an estimated daily output of 300 tons.

This new company will be the second coal producing enterprise in Mexico and in Spanish America.

This new company will probably market their coal entirely in Mexico, but they claim they will be able to ship to the United States, pay the duty of 75 cents per 2,240 pounds, and easily compete in Western Texas with the coal produced in the United States, principally from the Indian Territory. With the present large coal output in this consular district and prospective increased output, the high grade or quality, both for fuel and for manufacture of coke, of the Sabinas coal, it is not believed, that this district or in fact any part of Mexico tributary to the Mexican International Railway system offers a favorable market for coal from the United States.

EUGENE O. FECHÉT,
Consul.

PIEDRAS NEGRAS, MEXICO,
September 5, 1890.

* Report herewith follows.

Statement of tonnage of coal and coke imported into Mexico during the fiscal year ending June 30, 1890.

[Long tons.]

Port of arrival.	Where produced.	Coal.	Culm.	Coke.	Remarks.
		Tons.	*Tons.*	*Tons.*	
Guaymas	England	150.00	.....	.....	Arrives as ballast.
Matamoros	United States	1.10	.....	.....	
Nogales	Colorado and Indian Territory.	2,402.23	.....	.....	
Nuevo Laredo	Laredo, Texas	45,750.71	.....	.....	
Paso del Norte	Colorado	83,035.79	.....	5,357.14	Two-thirds from Indian Territory, one-third from Texas.
Vera Cruz	England	5,000.00	3,500	.....	
Do	United States	2,200.00	.....	.....	
Total	.....	138,539.83	3,500	5,357.14	

THE COAL MEASURES OF COAHUILA.*

REPORT BY CONSUL FECHÉT, OF PIEDRAS NEGRAS.

[Republished from Consular Report No. 113.]

As the Republic of Mexico is generally regarded as barren in Coal Measures of commercial worth, a statement of what has actually been accomplished in the past three years in proving the existence of extensive coal areas and in their development in a portion of the State of Coahuila will be of value.

The region of country bordering the Rio Grande River, from above Eagle Pass to below Laredo, Tex., and extending westerly and southerly over 100 miles in the State of Coahuila, belongs geologically to the cretaceous period. In the Rio Grande region the Coal Measures, as seen in the hills around Eagle Pass, Tex., and at Laredo, belong to the "Fox Hills" group in the classification of geologists.

This Rio Grande coal belongs to the class of cannels or semicannel coals. Cannel coals are valuable for household and general use as fuel, either for heat or steam production, and also for the manufacture of gas or the distillation of oil, but are valueless for manufacture of coke.

The Sabinas coal, as the Coahuila coal is called, on the other hand, is a highly bituminous coal, yielding by analysis from 60 to 70 per cent carbon, and produces an excellent grade of coke admirably adapted to all smelting purposes, whether of iron or the ores of the precious metals.

The extent of the coal areas in the State of Coahuila is not yet definitely determined, and hence this report will be limited to a general description of the coal areas that have been explored and are now being actually developed by the companies representing American capital, the Coahuila Coal Company and the Alamo Coal Company. These companies jointly own about 51 square leagues of territory, or about 220,646 English acres. This immense area is traversed by the track of

* In view of the future importance of the Coal Measures of Coahuila, a valuable report on the State of Coahuila—its situation, limits, and physical aspect—is republished, from Consular Report No. 92, in the supplement hereto.

the Mexican International Railway, and embraces a large portion of the valley of the Sabinas and Salado rivers.

Sabinas station, on the Mexican International, is 73 miles from the Rio Grande River at Piedras Negras, and has an altitude above sea level of 1,116 feet.

From Sabinas there is a standard-gauge railroad 13 miles to the coal mines at San Felipe and Hondo, where the coal companies have their main works. Here are offices, storehouses, miners' quarters, mining machinery, and all appliances for mining and shipping coal in large quantities. Explorations over this large area by prospecting shafts and the diamond drill have conclusively demonstrated that two and perhaps three coal horizons underlie this territory. The uppermost in the geological series of these coal formations is known as the "Laramie" group, and the one that belongs immediately beneath it is the Fox Hills group.

The Laramie and Fox Hills groups are well-known coal-bearing formations in Colorado, Utah, and Wyoming.

In Coahuila coal formations the same conditions are found to exist as in all other western coal formations.

The entire region appears to have been disturbed by some convulsions of nature, so much so that the coal horizons, instead of lying in horizontal planes, can be more accurately compared to an undulating inclined plane. The disturbing cause or force seems to have been exerted along a path from south-southwest to north-northeast, leaving the ridges and depressions running nearly west-northwest and east-southeast, and hence at many points the strata have been greatly disturbed and broken up, and faults occur in the continuity of the coal bed.

At some points the strata are nearly horizontal and in close proximity; have changed to an inclination of from 30 to 40 degrees. Other peculiarities of the formation were caused probably by forces at work simultaneously with the deposition of the coal material. The district was doubtless acted upon by swift currents of water that washed away portions of the vegetable material (basis of future coal), and clays were deposited in its stead.

Subsequently other coal material was deposited over the clays, and clays in process of time changed to argillaceous shales, these shales, representing what coal miners call a "horse;" where no subsequent deposit of coal material was laid down only a thin scale of coal will be found. Hence coal mining in the western coal formations in Utah, Colorado, and Wyoming, in the United States, and here in Coahuila, is subject to about the same conditions, viz, varying the thickness of the coal-beds, even within short distances, and to greater or less variation in the quality of the coal within equally circumscribed limits. The variation in thickness may extend even to an entire absence of coal from certain portions of the bed, and variation in quality may range from fine coal to merely carbonaceous shale. These varying conditions in

thickness and quality necessitate careful explorations with the diamond prospecting drill. This has been very exhaustively performed over large areas by the coal companies established at San Felipe and Hondo.

The Laramie strata can be traced along the north side of the Sabinas Valley a distance of nearly 40 miles, beginning a few miles above Sabinas station of the Mexican International Railroad and extending southward down the valley.

On the south side of the river Sabinas, some 20 miles from Sabinas station, coal croppings are found in strata equivalent to the Fox Hills group.

As coal of either the Laramie or Fox Hills age, or both, is well known to exist in Colorado and New Mexico along the eastern slopes of the mountains, it is evident that there is a belt of these two coal-bearing formations extending nearly or quite continuously from the valley of the South Platte in Colorado to the State of Nuevo Leon, Mexico. The coal at Sabinas is the only coal found anywhere in northern Mexico suitable for iron smelting and kindred metallurgical processes.

At many points on the Sabinas River thick beds of argillaceous shales occur, mixed with alternate layers of ironstone. This ironstone it is believed will some day prove of immense value for manufacture of pig iron.

The argillaceous ironstone of the Sabinas region, the mountains of magnetic iron ore in the neighborhood of Monclova, and the limestone found all over the country, in connection with the Sabinas coal and coke, comprise all the materials and requisites for the manufacture of iron.

The extension of the Mexican International Railroad to Durango will bring Sabinas coal and coke to the famous iron mountain of Durango.

When one considers that, save at the Sabinas coal mines, no coal is anywhere mined in all the territory of Mexico, and bearing in mind, too, the equally important fact that Sabinas coal produces a fine grade of coke, the immense value of these coal mines, now producing over 8,000 tons of coal per month, to Mexico is apparent. This coal is sold to the Mexican International and Mexican Central railways, shipped to the city of Mexico, and about 3,000 tons monthly is exported to the United States at Piedras Negras for the Southern Pacific Railway.

The development of iron manufacture, that is, producing pig iron from iron ores, and of the thousand attendant industries, will be of incalculable benefit to Mexico, as at present Mexico purchases all her iron and iron manufactures.

It is quite possible that the full development of the iron industries of Mexico, now for the first time made possible, or even probable, by the demonstrated fact that coal yielding an excellent coke exists in inexhaustible quantity in the Sabinas region, will prove of greater value to Mexico, will contribute more to the real comfort and well-being of her

people, and add more to the real greatness and wealth of the Mexican nation than have her immense resources in the precious metals.

So, to-day, in the United States, the united industries of coal and iron add more to the national wealth, strength, and prosperity than does the total yield, immense as it is, of our mines of the precious metals.

EUGENE O. FECHÉT,
Consul.

UNITED STATES CONSULATE,
Piedras Negras, December 6, 1889.

TAMPICO.

[From a report by Consul-General Sutton, of Nuevo Laredo, published in Consular Report No. 118.]

More important than the exportation of lead ores is the possible import of coal. All over Mexico, except near the United States border, prices range from $10 to $18 per ton. These figures do not include any duties, as stone coal is absolutely free of import duty. The Sabinas coal fields, back of Piedras Negras, furnish a medium coal, and I am inclined to think that they will find a better grade on lower levels. This is the only coal field in Mexico yet developed to any important extent, and the output, though considerable and increasing, does not begin to supply the demand.

When there are 15 feet on the Tampico bar, large sail vessels can bring Alabama coal on such terms as will knock off at least 25 per cent of the present prices. This would warrant the establishment of large smelters at many points near Monterey, Catorce, San Luis Potosi, etc., and greatly stimulate the mining industry. There are immense quantities of ores which can not be handled under present conditions, but which, with cheaper coal, would become profitable. The whole industrial development of Mexico is retarded by the high price of fuel, and cheaper coal would be of great importance.

TUXPAN.

Coal is not produced in this section of country, although there are croppings of the mineral in the interior of the country, but it is considsidered inferior.

There is but little of it consumed here, there being but one tugboat which uses it, and what is used is brought from the United States by the steamers or vessels consigned to the owner. The few steam engines which are here consume wood. At present there is no demand for coal.—John Drayton, Consul, Tuspan, Mexico, September 16, 1890.

CENTRAL AMERICA.

COSTA RICA.

REPORT BY CONSUL MACKEY, OF SAN JOSÉ.

The whole quantity of coal imported into Costa Rica during the fiscal year 1889 was valued at only $32,125.

The Government imports a very small quantity for the use of the national distillery. The remainder of all coal consumed in the country is imported and consumed by the Costa Rica Railway, and does not exceed 900 or 1,000 tons per month.

The Government purchases its coal in England; the railway imports Cahaba coal, furnished by the Export Coal Company of New York and Pensacola.

The American coal costs in the United States $3.50 per ton and can not be placed here for an additional expense of less than $3 per ton. All coal imported is brought in English steamers.

Coal is said to exist in various parts of Costa Rica; but if this is true, it is certain that the deposits have never been considered worth the trouble and expense of development. Costa Rica has a very small population and no manufactures, so that it is not a field in which our coal merchants may expect to extend their business.

BECKFORD MACKAY,
Consul.

UNITED STATES CONSULATE,
San José, Costa Rica, November 1, 1890.

GUATEMALA.

REPORT BY CONSUL-GENERAL HOSMER.

The consumption of coal in this Republic is of unappreciable quantity. Charcoal prepared on the spot, so to speak, is universally used for cooking purposes; artificial heating of houses is not employed, on account of the climate, and the small amount of manufacturing done, is carried on, as a rule, by means of the abundant water-power with which the country is supplied.

A small quantity of coal has been recently brought to the port of San José—some 42 tons, I believe, for the supply of an expected steamer,

which is intended to be used as the nucleus for a Guatemalan navy; but owing, as I am informed, to a matter of financial difficulty in paying for the vessel, the coal still awaits its arrival, and may not, therefore, be classified as yet in the category of consumption.

JAMES R. HOSMER,
Consul-General.

UNITED STATES CONSULATE GENERAL,
Guatemala, September 26, 1890.

179A——2

SOUTH AMERICA.

ARGENTINE REPUBLIC.

REPORT BY CONSUL BAKER, OF BUENOS AYRES.

I have to acknowledge the receipt of your circular of the 15th of August last, requesting information concerning coal and its consumption in the Argentine Republic.

NO COAL YET FOUND IN THE COUNTRY.

In reply I have to inform you that up to the present time no coal has yet been discovered of such qualities and in such quantities as to make it an object to mine it. All the coal consumed in the Argentine Republic is brought here from abroad; and each year, with the increase of inhabitants, the opening of new railways, and the inauguration of new industries the amount required begins to reach to very large proportions. The amount imported in 1888 was 333,798 tons; in 1889 it was 658,054 tons.

IMPORTATION FOR 1888 AND 1889.

According to the returns of the statistical office the coal imported for the years 1888 and 1889 came from the following countries:

Where from—	1888.	1889.	Where from—	1888.	1889.
	Kilos.	*Kilos.*		*Kilos.*	*Kilos.*
Germany	612, 110	707, 784	Holland	.....	1, 240, 000
Belgium	605, 000	2, 403, 889	Great Britain	319, 388, 781	582, 060, 667
Spain	.....	200, 000	Uruguay	3, 428, 571	8, 619, 107
United States	6, 451, 507	49, 764, 310	Unknown	3, 308, 580	8, 690, 994
France	4, 000	1, 913, 929			
Italy	.....	2, 363, 806	Total	333, 798, 549	658, 054, 480

What is credited above to Uruguay and "unknown" should doubtless be added to Great Britain; and while not questioning the accuracy of the returns for 1889 I am inclined to believe that no such amount of coal as is there given was received here from the United States. Certainly no such quantity was reported to this consulate, and I am almost equally confident that it did not go up the Parana River.

Nearly all the British coal shipped to this market comes from Cardiff, though Glasgow and New Castle also furnish a portion.

From this you will know that quite all the coal brought here is bituminous. Indeed there is scarcely any sale for anthracite coal in the

country, for the reason that furnaces here are not arranged for burning the hard coal.

SHIPPED ON SPECIAL CONTRACTS.

I am not able to state the prices paid for coal at the places of export. A very large proportion, such as that received by gas or railway companies, is shipped on special contracts extending through long periods, and the terms are always private and reserved.

FREIGHTS FROM ENGLAND.

In regard to freights from English ports, I can say that in 1887 they averaged about $5.16, gold; in 1888 about $6.80, gold, and in 1889, about $7.94, gold, showing an increase of upwards of $2.78, gold, per ton since 1887.

OUTSIDE CARGOES.

To outside parties in the coal trade here, cargoes of English coals during the last two years have been delivered at the following prices in gold:

Cardiff coal, in 1888, from $8 to $13 per ton; in 1889, from $12 to $14 per ton; Glasgow coal, in 1888, from $9.50 to $12.50 per ton; in 1889, from $13 to $14.50 per ton; Newcastle coal, in 1888, from $9 to $14 per ton; in 1889, from $12 to $14.50 per ton.

During the present year, the prices of 1889 have thus far been maintained. I have no quotations of coal received from other countries.

THE BUSINESS IN THE HANDS OF THE ENGLISH.

The coal business of the Argentine Republic is almost exclusively in the hands of the English merchants; while the railway and gas companies, which require immense supplies, are likewise under English control.

VESSELS ENGAGED IN THE TRADE.

The vessels engaged in the trade between the coaling ports of Great Britain and the River Plate are generally under the British flag, though there is a large number of Norwegian and Italian vessels also engaged in the trade. Last year the arrivals from Cardiff were 306 in number, with a tonnage of 182,306 tons; from Glasgow, 21 with a tonnage of 10,477 tons; from New Castle, 51 vessels with a tonnage of 30,450 tons, and from Newport, 104 vessels with a tonnage of 71,579 tons.

COALING STEAMERS.

While there is no so-called coaling station here, there is a large business done in furnishing coal to the steamers trading with this port. This is mostly done by means of lighters in the outer roads. The cost per ton for delivering and storing into bunkers on shipboard averages

about 50 shillings, and expenses to bunkers 6 shillings per ton. It is difficult to deliver more than 100 tons per day in the outer roads from coal lighters, the distance being about 5 miles from shore. Where coal is delivered to steamers in the port docks the price is less. Of course those who are engaged in the coal business here have all the facilities for storing and delivering it both on shore and in the roads.

HOW AMERICAN COAL MIGHT BE INTRODUCED HERE.

I have not considered that there was under the present circumstances any special opening here for our American coal, for the reason that there is no demand for the anthracite variety; and it has heretofore been understood that British bituminous coal can be put down here considerably cheaper than the same variety sent from the United States. Until a revolution can be effected in the furnaces generally used here, and those specially arranged for hard coal shall become fashionable, there will of course continue to be a preference for the soft coal; indeed, there is no sale here for any other.

In reference to the latter, if there are parties in the United States who wish to test the market here, the safest course would be for them to find out on what terms they could contract with gas or railway companies for the delivery of cargoes. This can only be done through agents sent here, with specimen cargoes, and clothed with full powers to arrange terms, sign agreements, and give the necessary guarantees for the fulfillment of their contracts. This seems to me to be the only way for an American company to establish a market here; for I am certain that such establishments as I have mentioned, which require immense quantities and must always keep a continuously large supply on hand, would not contract without the necessary guarantees or security; since otherwise they might be left at the pleasure of the foreign contractor, without the necessary stock. At the same time the agents sent here could attend to the establishment of agencies in this place and Rosario, or make arrangements with houses already known for the sale of their coals.

E. L. BAKER,
Consul.

UNITED STATES CONSULATE,
Buenos Ayres, November 26, 1890.

RIVER PLATE.*

It will be a long time before the official custom-house returns of the last year will be published, and for this reason I have clipped from the Buenos Ayres Standard the following statement of the receipts of coal,

* From a report of Consul Baker, of Buenos Ayres, published in Consular Report No. 115.

salt, and lumber in the river Plate for the year 1889, together with present prices of cargoes:

COAL.

Messrs. M. Trebino & Co., the great coal brokers, have favored us with their exhaustive report for 1889. The figures are most interesting and show the enormous development of the trade in the river Plate in one year.

Arrivals of coal.

Description.	1888.	1889.
In Montevideo:	*Tons.*	*Tons.*
From Cardiff	250,000	385,700
From other parts	48,000	68,000
Total	298,000	453,700
In Buenos Ayres:		
From Cardiff	195,000	382,500
From Cardiff for Rivers	78,000	128,547
From Glasgow	22,000	125,000
From Newcastle	29,000	
From Liverpool	22,000	
From various parts	3,500	
Total	349,500	636,047

The variation in prices of the two years is remarkable, viz:

Description.	1888.	1889.
Cardiff in Riachuelo	$8.00 to $13.00	$12.00 to $14.50
Cardiff for Rivers	8.50 to 15.00	14.00 to 17.00
Glasgow for Riachuelo	9.50 to 10.50	10.00 to 14.50
Newcastle for Riachuelo	9.00 to 14.00	12.00 to 14.50

NOTE.—These prices are in gold.

BRAZIL.

BAHIA.

REPORT BY CONSUL BURKE.

The coal consumed in this district is obtained from England, that used in the manufacture of gas being brought from Newcastle chiefly, though Wigan and other cannel is also used. The price of this or any other quality of coal at the place of export I am unable to obtain, as coal dealers are unwilling, as a matter of business, to declare their purchase price. The price of the coal here at the gas works is from 18 to 30 milreis per ton ($9.83 to $16.38.)

The coal for supplying steamers, factories, and mills is brought from Cardiff and Swansea. Of this quality there was imported in 1886, 54,924 tons, valued at £155,340; 1887, 49,303 tons, at a value of £91,211; in 1888, 49,824 tons, at a value of £93,420; in 1889, 66,972 tons, valued at £172,453. The above covers all that was imported for the time

specified, and is the price here, including what the gas company and the railway company import, for these companies import their own coal. There is one cotton mill in the place—in this city—that imports what it uses at or about 25 milreis per ton.

The coaling business is confined to two houses, viz, Wilson Sons & Co. and Edward Benn & Son. Both houses are English. Each has a contract to supply one line or more than one line of steamers that call regularly at this port. The line or lines having this contract pay a less price than a passing steamer would. Wilson Sons & Co. supply by far the greatest number of steamers that coal at this port, as I am informed. The coal is taken from the sheds or the vessel that brings it, placed in lighters that are towed alongside the steamer to be coaled, and from the lighters it is placed in very small baskets by the coalers, chiefly negroes; the baskets may hold 15 to 20 kilos. These baskets are tossed from one to another on the lighter and the ship until they reach the bunker, where the coal is deposited and the basket is sent back in the same manner to the lighter to be refilled.

The coal is principally brought here in Norwegian barks or ships. Very rarely does an English sailing vessel or one of any other nationality come here with coal.

The closing price for 1889 was nearly 50 shillings per ton. The present price is from 51 to 52 shillings. During the coming year it is said the price will advance. By the regulations of the custom-house no duties are paid on coal. What is called an *expediente* is, however, paid. It is really a tax, and amounts to 1 or 1½ shillings per ton on all coal entering this port. There are said to be coal fields in this consular district, but so far as I am informed not one is yet developed.

DAVID N. BURKE,
Consul.

UNITED STATES CONSULATE,
Bahia, November 8, 1890.

PARA.

REPORT BY CONSUL KERBEY.

The section of Spanish-Portuguese America embraced in the Para consular district being on the equator, the direct rays of an almost vertical sun generously supply all the caloric required for animal and vegetable life.

With very rare exceptions, there are no chimnies to the houses in this country. What little cooking the people are compelled to do is usually performed by charcoal or the use of wood.

The very limited use of fuel for the lighter manufacturing of tin packages and similar industries have been supplied by one local dealer, who

imported one shipload of coal, but who, I believe, has recently retired from the business.

The Para Gas Company is an English corporation, which gets its supplies entirely from England, furnishes an inferior quality of gas-light, and, I believe, sells the resultant coke for almost as much as the original cost of the coal.

A well-managed electric lighting company might be successfully established at Para.

The wonderful extent of steam transportation from North Brazil to all parts of Europe and America and the Amazon River and its tributaries, as well as in the coastwise trade south, consumes an enormous quantity of coal; but generally these steamship corporations are owned in England and, as a rule, obtain the greater portion of their fuel from their home mines.

"The Amazon Company," as it is generally called, and which has in active operation a fleet of twenty-five steamers, and navigates the 50,000 miles of inland waters of this river and its numerous tributaries, is an English corporation, well managed, in the absence of the general manager, Mr. Hudson, by Capt. E. Pontet, who invites American competition as to prices of fuel.

The average monthly consumption of coal by the steamers of this Company is about 2,000 tons. It is obtained principally from South Wales by sail, at an average cost, put down in Para, of 35 shillings ($8.51) per ton.

Some English coal from Yorkshire and Gool has been tried, but it is found to be "very swift," as they term it, or quick burning, the difference against its use being estimated at 5 per cent. It is also hard on the fire bars. The large-steamer coal from Wales is inferior to the other.

The average cost in Great Britain is 14 shillings per ton. The principal carriers are Norwegian and German sailing vessels, with some English, who bring out from 500 to 800 tons each, in from twenty-five to forty days, usually returning in ballast to our southern ports of Florida and Georgia for return cargoes of lumber, etc.

The Amazon Company has tried one shipment of American double-screened coal, obtained from New York by steamer, at a cost of 35 shillings. It was reported very good steamer coal, swifter than South Wales, say a difference of 2½ per cent against American coal. They propose trying a shipment of unscreened American coal. No hard or anthracite coal is used here. I am advised by the captain of an English vessel that visits New York that the engineers of these vessels do not properly understand how to handle American coal, to obtain the best results.

The United States and Brazil Company, or American line, coal at Newport News, St. Thomas, and Rio.

Ten steamers of the Red Cross Line call at Para. The agency at Para maintains a coal deposit at this port in the shape of a large old hulk anchored in the harbor, with steam winch for receiving and dis-

charging coal. All coal supplies come from Liverpool, all contracts for the same also being made there at the home office of the line.

The Booth Line comprises a fleet of ten steamers engaged in trade between the Amazon and other North Brazilian ports and the United States and Europe. The steamers of this line obtain the greater part of their coal from England, it being brought out by their own steamers as ballast or to fill up cargo, of which they deposit surplus here for their own use. The steamers on the New York routes, as a rule, coal at New York.

The agent of this line states that without being able to classify exactly the coal taken at New York, the surplus which is occasionally deposited here has sometime been sold as "Clarion lump coal." Sometimes, also, the surplus has consisted of unscreened coal, which is not at all marketable in Pará and Manáos when Cardiff coal can be obtained at a much higher price than that of the unscreened coal.

American coal costs, on an average here, freight and duties (5 per cent) paid, $9 per ton, at which price, the same agent says, good English coal can be imported too.

There is no import duty on coal,though the custom-house authorities exact a charge of 5 per cent as incidental expenses, or, as they term it, *expediente*, charges for their trouble.

The Brazilian Lloyd Steamship Company is entirely Brazilian in its management. It runs seven steamers, registered at 1,999 tons each, at intervals of ten days, from Rio de Janeiro to Manáos, but coaling only at Rio de Janiero, Pernambuco, and Maranham. They find the prices higher at Pará than at those points. The data concerning the consumption of coal by that company are not attainable at this port, but only at the home office at Rio de Janeiro.

COAL IN THE AMAZON VALLEY.

A resident of the village of Monte Alegre, 450 miles up the Amazon from Pará, some two or three years ago thought that he had found indications of the presence of coal at that point. He spent some time and money in sinking a shaft, and encountered rocks which he affirmed to be of carboniferous date; but at latest advices no coal had been found.

JOSEPH O. KERBEY,
Consul.

UNITED STATES COSULATE, *Pará, October* 9, 1890.

PERNAMBUCO.

REPORT BY CONSUL STEVENS.

Desiring to make an answer to the coal circular letter of the Department of August 15 as quickly as possible, and feeling confident, as I certainly do, that American merchants could with a proper understand-

ing of the situation come into successful competition with those now engaged in the business, I beg to submit the following report:

(1) The coal consumed in Pernambuco may be said to be exclusively obtained from Great Britain.

(2) In round figures it may be stated, with a good degree of accuracy, that there are about 60,000 tons of coal shipped to this port annually.

(3) The kind consumed at this port is almost entirely that known as South Wales or Cardiff (of the well-known denominations as Ocean Merthyr, Cory's Merthyr, Nixon's Navigation, etc.), with a small amount of North Wales and North Country (Newcastle) coal, some gas coal, a little patent fuel, and a few odd shipments of inferior qualities from Rotterdam and Hamburg.

(4) The price at place of export, as above stated, may be taken as varying from the extremes of $1.92 to $3.60 per ton according to quality.

The market price here varies at present from 20 to 28 milreis ($10.92 to $15.28) according to quality.

The last price given, 28 milreis per ton, is the current price for best South Wales put into bunkers.

(5) The vessels employed embrace those of all seafaring nations, with a large predominance of Norwegian barks, the Swedish being next in rank. The classes of vessels in use differ from first to third class, even the lowest class being sometimes represented. First-class vessels, however, have the preference, especially when they arrive here in the sugar season, as they can invariably obtain outward cargoes of this commodity, for which their rating makes them the most suitable.

MISCELLANEOUS INFORMATION.

Quality.—The coal that usually finds sale here, I am informed, is required to be "double screened" at the time of shipment, and on arrival of the ships the cargoes are discharged into lighters, which are in like manner discharged into depots on shore.

Consumption.—The greatest outlet for coal at this port is the supply of steamers and railways, and this is entirely a contract business. The quality used at the present time is almost invariably designated as "best South Wales." The local sugar, cotton, and other factories or mills use principally the harder and cheaper coals.

Direct importation.—There is a strong growing tendency, I am informed, on the part of the consumers to import their own coal, and in this inclination lies the best prospect for American exporters of this article. A good agent, who understands his business and is acquainted with the language of the country, Portugese (Spanish or French will stand him in good stead), should be selected, one who can represent the combined American interests.

Coal firms.—The coal business at this port is principally in the hands of two firms, one Brazilian and one English. The Brazilian firm is Livra-

mento & Có.; the English firm is known as Wilson Sons & Co. The Brazilian house does more of the local trade, perhaps, than the other, such as the supplying of factories and railroads under Government control. The other firm, Wilson Sons & Co., supplies steamers, such steamers being under contract to purchase coals only of their houses at stipulated prices. These two established houses, however, have to contend with the following interference: Some of the regular and tramp cargo steamers from Liverpool, when short of freight, fill up with coals of the cheaper class, and are, of course, willing to sell the same at reduced prices. Supplies to steamers are paid for by captain's draft on owners, and are, of course, sales for cash; generally, however, long credit is given. Nearly two-thirds of the supplies furnished at this port are for the use of steamers, and, as was before stated, under contract.

The prejudice is in favor of South Wales coal, and engineers, who are accustomed to this quality of coal, and the firemen knowing how to "fire it," will not accept any other kind if they can help it.

COAL FIELDS OF BRAZIL.

In a very pleasant interview with the able governor of this State, Baron de Lucena, a few days since, I availed myself of the opportunity of asking information covering this point. He replied that there were no coal fields as yet discovered in this State, but in Rio Grande do Sul a mine is worked which furnishes to railroads and steamers most of their supplies. He also informed me that in Santa Catharina and São Paulo and at other points, coal beds are discovered but not yet developed, however with good prospects for development.

CHARGES AND DUTY.

The import duty on coal at this port is 7 per cent;* lighterage costs about 55 cents per ton, and the handling can be done for about 50 cents per ton.

EDWIN STEVENS,
Consul.

UNITED STATES CONSULATE,
Pernambuco, October 17, 1890.

RIO GRANDE DO SUL.

REPORT BY CONSUL NEGLEY.

During the year ending October 1, 1889, there were imported into the State of Rio Grande do Sul 11,897 tons of soft coal, chiefly from England and in British hulls, as will more particularly appear by the state-

* The new tariff of Brazil has placed coal on the free list.

ment herewith inclosed. In regard to the prices of coal at the mines and delivered here, it appears the gas company of Rio Grande do Sul, which includes under its management the gas companies of Pelotas and Porto Allegre has, during the past year, paid from 7 to 8 shillings per ton for common gas coal at the mines in England and 37 shillings 6 pence to 48 shillings freight from Garstown to Rio Grande do Sul. For cannel coal, a small quantity of which is used to purify the gas, the company pays from 10 to 12 shillings per ton at the mines, the freight being the same as for common coal. The railroad company here, which is the next largest consumer of coal at this point, uses a prepared fuel which is manufactured from the dust of the mines mixed with coal tar and pressed into cubes of about 1 foot square. This fuel costs the company from $11 to $15 per ton delivered here, the latter price being rather exceptional. Mr. Otero, of Otero, Gomes & Co., a firm which supplies several steamship lines with coal and claiming to enjoy special facilities for securing cheap freights, informs me that during the past two years his firm has paid from 32 shillings 6 pence to 40 shillings freight on coal from England. What the coal costs them at the mines he did not say, but freight is the main item of expense and is very high, from the fact that it is hard to secure return cargoes. The insurance is also unusually high, owing to the dangerous character of the bar at the entrance to the port of Rio Grande do Sul. Mr. Otero thinks there is no chance for the United States to compete with England in the coal trade because of the still greater difficulty of obtaining return cargoes from here to the States. It is expected that the improvements to the bar now contemplated will, when finished, materially reduce freights and insurance. These improvements can not be completed, however, at the lowest calculation, under eight years. At present, vessels bound for this port should not draw over 8 feet to be within a safe limit for coming over the bar. There is no tariff on coal, nor will there be, as I understand, under the new tariff, which goes into effect on January 1, 1891, but in common with all other free goods it is necessary now to pay what is called an *expedient* of 5 per cent ad valorem. This expedient of 5 per cent is, however, abolished, I believe, under the new tariff.

In regard to coal mines in this State there is but one in operation, that of the "Companhia Estrada de Ferro Minas de San Jeronymo," about 50 miles west of Porto Allegre. The annual output since 1884 is given in the accompanying table by E. S. Eugenio Dähue, the engineer of the mines, from which it appears that there has been a gradual increase in the number of tons raised from 3,461 tons in 1884 to 8,000 in 1890.

The company owns and manages a factory for the manufacture of "briquettes," a fuel prepared from the dust of coal and coal tar. Of coal dust there was obtained during the year 1889 2,305 tons, out of which was manufactured 2,194 tons of "briquettes." The company

claims that the coal is gradually improving in quality; but Dr. William Ahrons, who was engineer of the mines a few years ago, says that this is impossible, as the strata of coal is the same. It is all from the same level, and there can be no material change in its quality. It is a soft coal of recent formation, with numerous thin laminæ or layers of schist running through it, and is of the grade known as "Newcastle." The thickest part of the vein from which the coal is obtained is at present 2½ meters, or a little over 8 feet in thickness. This vein, as I have said, is not of pure coal, but seamed with layers of schist. The Companhia Estrada de Ferro de Porto Allegre a Uruguayana, whose railroad runs from the Margin, some 50 miles west of Porto Allegre, on the Taquary River, to Cacequey, uses this coal exclusively. This railroad company uses Baldwin locomotives, and claims the coal gives good satisfaction. At any rate it is the most economical fuel they can procure. The coal has also been used on the Estrada de Ferro de Porto Allegre a Novo Hamburgo; but as the price has recently been raised to something near the price of foreign coal, this company maintains there is no economy in its use. The experience of the Estrada de Ferro do Rio Grande a Bajé in the use of this coal has not been satisfactory, and consequently they use an imported patent fuel. Some of the steamboats plying the numerous rivers centering at Porto Allegre use the San Jeronymo coal in connection with wood.

While there are no other coal mines there are indications of coal at various other points. Dr. Ahrons says he knows a vein of pure coal measuring 15 centimeters in thickness, and other outcroppings of various thicknesses in the northwestern section of this State.

A little west of Candiota, a station on the Estrada de Ferro do Rio Grande a Bajé, some 140 miles west of this city, there crops out coal measures in a cut through which the railroad passes. The seams of coal are very thin, not more than an inch or two in thickness; but some think good coal may be found by boring deep enough. There is some talk of forming a company to explore this territory.

CHARLES NEGLEY,
Consul.

RIO GRANDE DO SUL,
December 8, 1890.

Importation of coal into the State of Rio Grande de Sul, Brazil, for the year ended October 1, 1890.

Month.	From—	Days.	Nation.	Class.	Consignee.	Cargo.	Remarks.
1889.						*Tons.*	
Oct..	Newport....	74	British	Lugger...	T. F. de Rocha.....	230	For Pelotas.
	Swansea....	88	Dutch	Schooner .	Rheingantz & Co...	242	Woollen factory.
	Liverpool...	53	British	Lugger ..	Gas Co	518	One company operates in Rio Grande do Sul, Pelotas, and Porto Allgre.
	Cardiff.....	77	Dutch	Brig	Wm. Claussen & Co.	272	Rio Grande do Sul.
	....do	65	British.....	Bark.....	Rheingantz & Co...	451	
Nov..	Liverpool...	82	German.....	Brigantine	Gas Co	220	
	Cardiff.....	60	British.....	Schooner .	Railroad Co	230	Estrado do Ferro, southern Brazil, Rio Grande do Sul.
Dec..	....do	66	Dutch	Brig	Rheingantz & Co...	303	
	Newport....	46	Norwegian .	Schooner .	S. Montinho	153	Rio Grande do Sul.
	Cardiff.....	49	Dutch	Lugger...	Railroad Co	304	All railroad coal, patent fuel.
1890.							
Jan..	....do	42	Norwegian .	Bark.....	....do.....	672	All marked railroad company for same company.
	Swansea....	56	....do	Brigantine	Viera Mendes, E. F.	242	
	....do	64	Dutch	Schooner .	Otero Gomes & Co.	241	Rio Grande do Sul and Pelotas.
Feb..	....do	65	....do	....do	Conceicão & Co	200	Pelotas.
Mar.	Cardiff.....	70	Danish	Brigantine	Railroad Co.....	218	Patent fuel.
	Liverpool...	46	British.....	Lugger...	Gas Co	304	
	Cardiff.....	66	....do	....do	Railroad Co.....	522	Do.
Apr..	Liverpool...	65	....do	Schooner .	Gas Co.....	241	
	....do	44	....do	Lugger...	....do.....	443	
	....do	67	German	Brigantine	....do.....	301	
	.. do	70	British.....	Lugger...	....do.....	330	
	Grange-mouth.	104	Danish	Brigantine	....do.....	207	
May .	Ardrossan ..	53	British.....	Lugger ..	....do.....	294	
June	Liverpool...	54	Norwegian .	....do	....do.....	305	
	Cardiff.....	46	British.....	....do	Railroad Co.....	525	Do.
	... do	61	Brazilian ...	Schooner .	Otero Gomes & Co.	224	
	Montevideo.	8	British.....	Lugger...	J. M. Garcia & Co..	270	Rio Grande do Sul.
	Cardiff.....	66	....do	....do	Conceicão & Co	229	
	Swansea....	62	Norwegian .	Brigantine	...do.....	207	
July .	Rio de Janeiro.	24	Brazilian ...	Bark.....	Order	280	
	Bahia	23	....do	Brigantine	P. T. C. Leite	200	Do.
	Cardiff.....	55	British.....	Lugger...	Rheingantz & Co ...	370	
Aug .	... do	66	Danish	Brigantine	H. Rio Grandense].	220	
	Glasgow....	60	British.....	Lugger...	Gas Co.....	243	
	Swansea....	66	....do	Brigantine	Otero Gomes & Co..	242	
	Montevideo	9	Norwegian .	....do	Visconde San Juan do Norte.	260	Do.
	Bahia	24	Brazilian ...	....do	V. Mendes & Filhos.	209	
	Rio de Janeiro.	4	British.....	Steamship	Otero Gomes & Co..	400	
Sept.	Liverpool...	65	.. do	Lugger...	Gas Co.....	291	
	Cardiff	60	....do	Schooner	Rheingantz & Co...	209	
	Liverpool...	62	Norwegian .	Brigantine	Gas Co.....	193	
	Total ..	...	.....	.....	.....	11,897	

RECAPITULATION.

Consignee.	Where consigned.	Cargo.
		Tons.
Gas Company	Rio Grande do Sul	3,890
Railroad Company	do	2,371
Rheingantz & Co	do	1,575
Otero Gomes & Co	Rio Grande do Sul and Pelotas	1,107
Conceicão & Co	Pelotas	636
Viera Mendes & Filhos	Rio Grande do Sul	433
Others		1,885
Total		11,897

Output of the San Jeronimo coal mines.

	Tons.
1884	3,461
1885	6,058
1886	6,359
1887	5,188
1888	7,691
1889	6,644

In 1890 probably 8,000 tons will be obtained, as up to the 1st of November 6,500 tons had been raised.

BRITISH GUIANA.

REPORT BY CONSUL WALTHALL, OF DEMARARA.

The demand for coal in British Guiana is chiefly for the use of the sugar estates, and to a less extent for that of the colonial steamers, the one railway and a few small manufactories.

The coal thus used is obtained chiefly from Great Britain. The imports in 1889 amounted to 98,483$\frac{3}{16}$ tons, of which 97,769$\frac{1}{16}$ tons were from the United Kingdom, 453 tons from British America, 137½ tons from the United States, 120 tons from France, and 4 tons from the Danish West Indies.

The total value, according to the custom-house reports, was £87,164 1*s.* 6*d.*, equivalent here to $418,387.60, or a fraction less than $4.25 per ton. The value of the imports from the United States was £114 11*s.* 8*d.*, equivalent to $550, or just $4 per ton. The cost of the coal as delivered here, including charges and a duty of 2 shillings, or 48 cents, per ton, varied from $5.50 to $7.75 per ton.

This statement does not include 125 hogsheads of "coal in hogsheads," imported from Great Britain during the same year, valued at $631.16, or about $5.05 per hogshead, on which the duty is 32 cents per hogshead.

There are no coal dealers, properly speaking, in this colony. The usage is that the proprietors or managers of the sugar estates or steam engines needing it send their orders—generally some months in advance—directly to the mines, from which it is received without passing through the hands of any intermediate agency.

Planters inform the writer that the trials of British American coal which have been made have resulted unfavorably. But little effort has been made to introduce coal from the United States until quite recently. A few months ago a cargo of 400 or 500 tons of what is known as Westmoreland coal was imported from Philadelphia, for the Colonial Company, Limited, a corporation which owns several large estates in this colony, as well as some in Trinidad. Careful experiments have been made on two of this company's estates—Peters Hall and Hampton Court—to ascertain the comparative merits of the American and British

coals. Through the kindness of Mr. Glennie, one of the attorneys (or managing agents) of the Colonial Company, I have been enabled to obtain copies of the reports of these experiments, made by the respective engineers of the two estates, and herewith submit them.

The comparison seems to have been made in one case with Scotch, in the other with English coal, the particular species not being specified in either case. Although the details are perhaps fully intelligible only to experts, yet the results, so far as understood, seem to be somewhat doubtful in the former case, but decidedly favorable to the American article in the latter, that of Hampton Court. In consideration of its cheaper cost, the American coal would seem, upon a whole, to be fairly entitled to preference, or at least to more thorough trial.

With reference to one of the queries in the Department circular which has elicited this report, it may be stated that the coal now in use in this colony is imported chiefly in British and Norwegian, but in some cases in American or German vessels.

W. T. WALTHALL,
Consul.

UNITED STATES CONSULATE,
Demerara, January 9, 1891.

COAL TESTS.

[Inclosure 1 in Consul Walthall's report.]

PLANTATION "PETERS HALL,"
December, 1890.

DEAR SIR: As requested by you I have made a series of trials of the American and Scotch coals at present on this estate. These trials, four in number, were made with No. 1 boiler, which is of the Lancashire type, and was erected here about six months ago. Arrangements were made to give the boiler a separate feed during the trials, so that the quantity of water evaporated might be accurately measured. The samples of coal used were taken impartially from the face, and I think represented fairly the average composition of the heap. The Scotch coal showed a clean fracture and was comparatively free from dust or "gum." The American coal, on the other hand, was soft and seamy, and contained a large proportion of gum, in fact it looked as if in had not been properly screened before leaving the pit mouth, but this, of course, may have been due to handling during shipment. As to the conduct of the coal in the furnaces, the Scotch coal burned readily and only required pricking from below the bars, from time to time, as they got dull, while the American coal seemed to form a cake over the fire, and this required to be frequently broken up or a fall in steam pressure resulted. There was not much hard "clinker" in either case.

The table following gives the results got and deducted from the trials, and shows that 1 pound of Scoth coal will evaporate 0.8 pounds of water more than 1 pound of American coal. My opinion is that had the American coal been as free from dust and gum as the Scotch it would have been little or nothing behind in evaporative efficiency.

GIB. A. STEWART.

R. G. DUNCAN, Esq.

Table of daily results.

[Boiler No. 1. Type, Lancashire. Dimensions, 28 feet long by 7 feet diameter. Effective heating surface, 700 square feet. Grate surface, 33 square feet. Number of trials, 2. Date and duration of respective trials: American coal, Monday, 22d, 4 hours and 20 minutes; Tuesday, 23d, 4 hours and 22 minutes. Scotch coal, Tuesday, 23d, 3 hours; Wednesday, 24th, 3 hours and 23 minutes.]

	American coal.		Scotch coal.	
	First trial.	Second trial.	First trial.	Second trial.
Average steam pressure ..... pounds..	62.4	59	64	63
Average temperature of waste gases ..... degrees..	457	425	500	475
Average draft in flue ..... inches..	.3	.3	.35	.3
Coal burned ..... pounds..	2,697.5	2,359	1,837.5	2,213
Water evaporated ..... do....	17,040	13,455	12,520	15,270
Temperature of feed water ..... degrees..	84	85	85	84
Water evaporated per pound of coal ..... pounds..	6.326	5.703	6.813	6.900
Coal burned per hour ..... do....	622.5	540.31	612.5	654.15
Coal burned per square foot grate surface .... do....	18.863	16.373	18.560	19.822
Water evaporated per hour ..... do....	3,932.31	3,081.31	4,173.33	4,513.74
Water evaporated per square foot grate surface do	110.017	93.373	126.464	136.780
Water evaporated per square foot heating surface, pounds	5.617	4.402	5.962	6.448

AVERAGE RESULTS FOR TWO TRIALS.

Steam pressure ..... pounds..	60.7	63.5
Temperature of waste gases ..... degrees..	441	487.5
Draft in flue ..... inches..	.3	.325
Water evaporated per pound of coal ..... pounds..	6.014	6.856
Coal burned per hour ..... do....	581.405	633.325
Coal burned per square foot grate surface ..... do....	17.618	19.191
Water evaporated per hour ..... do....	3,506.81	4,343.53
Water evaporated per square foot grate surface ..... do....	101.695	131.622
Water evaporated per square foot heating surface ..... do....	5.009	6.205

REPORT ON THE EVAPORATIVE PERFORMANCE OF A BOILER OF THE LOCOMOTIVE TYPE FIRED WITH AMERICAN AND ENGLISH COAL.

[Inclosure 2 in Consul Walthall's report.]

PLANTATION, HAMPTON COURT,
Demerara, December 21, 1890.

General remarks.—The experiments, the particulars of which will be found in the accompanying report and table of results annexed, were carried out to ascertain the comparative evaporative values of two different classes of coal supplied to this estate previous to the commencement of the crop in October, 1890, the English coal being a portion or portions of a cargo or cargoes sent out to this colony by the Colonial Company, Limited, while the American sample was, as I understand, a shipment from that country purchased in the colony by the company's agency in Georgetown. For the purposes of experimenting with these coals it was thought advisable to delay the trials until sugar making had been stopped in the factory, in order that the coal boiler might be under fire alone, thus enabling a steadier firing and generation of steam to be kept up in this boiler during the trials than would have been possible had the boiler been under steam at the same time as those in the same range and fired with megass, hence the delay in getting the particulars for this report. The steam generated during the trials was utilized in the distillation of rum and in working a small direct acting feed pump as well as in another engine used in pumping water for cooling the worms, etc. The boiler in question was, as already mentioned, of the ordinary locomotive type, with self-contained fire box and fitted with seventy tubes 3¼ inches exterior diameter and 13 feet 7¾ inches long between the tube plates, with a total grate

area measuring from side to side of fire box of 18.74 square feet, and a gross heating surface, including fire box, tubes, etc., of 890 square feet, through a short length of brick flue to the main factory chimney, and the damper fixed in the small flue for regulating the draft was set and kept at one and the same uniform height during the trials with both coals, and just sufficient to give the requisite draft required for burning the fuels freely. It must be, however, understood that no attempt was made on either of the days of trial to force the fires in any way beyond what was required to keep up the steam pressure to about 50 pounds per square inch (by gauge), and the results therefore as given in the annexed table represent fairly well those that would be obtained daily under similar circumstances and conditions. For the purpose of supplying the boiler with feed water the same measuring tanks and small direct acting Deane steam pump connected thereto as were fixed up and utilized during the trials of the megass fired boilers in the early portion of this year were also utilized during these trials, and as full particulars concerning the arrangement then used can be obtained on reference to previous reports, it will not be necessary for me to enter into further details now.

I would, however, mention that in order to prevent any loss of water through the blow-off cock attached to the boiler, I slipped in just previous to the trials a blank flange on the boiler side of the cock, and care was also taken to prevent any of the measured feed water with which the boiler was supplied from entering the main feed pipe, to one end of which the temporary feed connection from the small Deane pump was attached. So far also as I could ascertain no priming took place during the days of trial, as had there been any water coming over into the main steam and other pipes, it would have shown itself by the blowing of the steam trap attached to the main range, and also in the engines at work, but I noticed no indications of the above nature. On starting the trials each day, the fuel previously in the grate was allowed to burn low, and the steam stop valve having been quickly locked down the water level was taken and marked on the gauge glass, the valve being again opened and firing with the weighed fuel at once commenced.

On the conclusion each day the water in the boiler was brought as nearly as possible to the orginal level, and the fire left also as much as possible in a similar condition to that in which at the commencement of the day's trial, the steam pressure being about the same throughout with variations of about 5 pounds per square inch either side of the average pressure shown on the table. The coals each day were filled into the tip truck sent out recently with the portable railway made by Messrs. Fowler & Co., of Leeds, and afterwards made on the scale, also supplied by the makers of the railway. At the conclusion also of each day's trial the ash pit was cleaned out and the ashes and unconsumed small coal mixed with same was weighed, and in the table of results I have it will be found, calculated the evaporative results, etc., both including and deducting this ash.

It will be as well to mention, in concluding these preliminary general remarks, that all the coal burned during these trials, both American and English, was picked lumps of varying size, but mostly large, taken from different parts of the coal heaps.

My object in thus selecting the coal was to obtain as far as possible dry fuel, as had I shoveled it up direct from the heaps I should have have had to contend with considerable moisture contained in the fine coal, and this would have been especially the case in dealing with the American coal, the heap of which appears to contain a considerable proportion of fine coals. By taking the lumps only from each heap I obtained the fuel practically dry.

Memo.: On the American coal.—This was the first coal tested, and, as will be seen on reference to the table of results, its evaporative efficiency per pound of water was, contrary to my expectation, rather in excess of that obtained with the English coal. This coal is of rather bright luster, and I should say slightly bituminous, easily broken, and reveals, on breaking, the fact that it is made up, so to speak, in distinct layers of various thicknesses. On first charging with this coal it will be found that

it is inclined to and does cake together slightly and gives off, for a short time after charging on, a rather dense black smoke, which, however, quickly clears off as the coal gets heated. As soon as the first heavy smoke clears off, the coal burns clearly, but with rather a short flame, and owing to its tendency to cake, as mentioned above, it appears to require lifting and opening out slightly, but frequently, in order to burn the fuel to its best advantage. It ignites readily, and little or no clinker appears to form from its combustion, but small white lumps fall through the bars on lifting or cleaning the fires. It was, I think, owing to this constant lifting and opening out of the fires, when burning this coal, that the per cent of ash, etc., from it appears by the table to be rather higher than that obtained from the English coal, and I should say that it would be an advantage in using this coal to have the fire bars arranged with a medium air space between the bars, to prevent loss of fuel on stirring up, provided the draft was kept fairly sharp. I noticed also that this coal did not require such constant charging on to keep up the steam as in the case of the English coal, being the contrary to what I had expected. On the table will be found the average weight per cubic foot of this coal, calculated from six samples of small dry lumps selected from various parts of the heap, filled into a box of 1 cubic foot capacity, and afterwards carefully weighed on a small and sensitive Fairbank's scale, the average weights of each box being given below:

	Pounds.
First box	48.75
Second box	48.75
Third box	49.75
Fourth box	50.25
Fifth box	48.75
Sixth box	46.75
Total for the six boxes	293.00

Average weight per cubic foot, 48.83 pounds net; average weight per cubic foot per ton, 45.87.

Memo. on the English coal.—This coal, in contrast to the American coal mentioned above, is of a dull, slaty color, very hard and of homogeneous structure, having rather the appearance of a solid piece of slate when broken. It ignites readily, throwing off at first a brownish yellow smoke, not quite as dense and heavy in appearance as that emitted by the American coal in first charging, but which gets lighter as the fuel catches up. It appears to burn with a very much longer flame than the American coal, and does not coke, but is inclined to clinker rather more. As mentioned above, however, in spite of its solidity I noticed that the coal appeared to burn away rather more freely than the American sample, but as will be seen on reference to the table of average results, the difference in the consumption per hour between the two coals was not very great. The average weight of this coal, also calculated from six samples of small dry lumps selected from various parts of the heap and measured as in the case of the American coal, is given below:

	Pounds.
First box	44.75
Second box	45.75
Third box	47.00
Fourth box	45.75
Fifth box	45.25
Sixth box	45.00
Total for the six boxes	273.50

Average weight per cubic foot, 45.58 pounds net; average weight per cubic foot per ton, 49.14.

CONCLUDING GENERAL REMARKS.

In concluding this report, and drawing a comparison regarding the observed evaporative efficiency of the two classes of coal under consideration, I think that it may be fairly assumed that on a prolonged test there would be but little to choose between them so far as their efficiency is concerned. Although the American coal during the comparatively short trial just carried out has indicated a slightly higher evaporative power than that obtained from the English coal, and appears to work fairly well with ordinary care in the class of coal boiler, in use on this estate, still I am inclined to think that owing to its short flaming power, and also to its tendency to coke under combustion, thereby requiring constant and careful attention on the part of the stoker, that possibly this coal would not, if used in a long Lancashire or Cornish boiler, develop the same evaporative efficiency in comparison with the English sample as has been obtained in the locomotive boiler just experimented with. Of course this is a question that can easily be decided on any estate having one of the above-mentioned boilers (say a Lancashire), and a small stock of this coal on hand; accordingly I have merely called attention to the above facts. Bearing in mind also that the American coal is of a softer nature and a more easily broken fuel than the English coal lately supplied, it is possible that a considerable loss might occur, both in transit and in the burning of it, which would have to be set off against the advantage derived from the fact of its being a cheaper fuel.

THOS. W. GILL.

Table of flue temperatures in degrees, Fahrenheit, taken just outside of the smoke box with a Bailey's pyrometer.

Dates of trial.	American coal.	English coal.
December 15	350, 340, 350, 355, 355, 350, 340, 375	
16		340, 325, 340, 340, 330, 340, 350, 340, 330
17	350, 350, 355, 340, 345, 350, 350, 340	
18		345, 365, 370, 350, 355, 350

Evaporative performance of a boiler of the locomotive type, fired with American and English coal.

[Size of boiler, 5 feet diameter by 18 feet 6 inches long (including firebox). Number and size of tubes, 70—3¼ inches external diameter by 13 feet 7¾ inches long. Gross heating surface (including firebox), 890 square feet. Grate area (measuring to sides of firebox each way), 18.74 square feet. Ratio of gross heating surface to grate, 47.4 to 1.]

DAILY RESULTS.

	American coal.		English coal.	
Average weight of each coal per cubic foot, from six samples of each coal.....pounds..	48.83	.....	45.58	.....
Equivalent number of cubic feet per ton	45.87	.....	40.14	....
State of weather on respective dates of trial	Showery.	Fair.	Fair.	Showery.
Average pressure of steam on boiler (by gauge).....sq. inch..	50	50	50	50
Average temperature in degrees, Fahrenheit, of the feed-water	80	80	80	80
Dates of trial	Dec. 15	Dec. 17	Dec. 16	Dec. 18
Duration of trials on the respective dates.....hours..	8.23	9.33	9.16	8.75
Gross pounds of fuel burned (not deducting ashes, etc.).....	3,325	3,397	3,539	3,502
Pounds of ashes etc., left in ashpit at conclusion of trial.....	360	367	248	232
Percentage of ashes, etc	10.82	10.8	7	6.62
Net pounds of fuel burned (deducting ashes, etc.)	2,965	3,030	3,291	3,270
Gallons of water evaporated on the respective dates	2,345	2,450	2,317	2,192
Pounds of water evaporated on the respective dates.....	23,450	24,500	23,170	21,920
Pounds of water evaporated per pound of fuel (not deducting ashes, etc.).....	7.05	7.21	6.54	6.25
Pounds of water evaporated per pound of fuel (deducting ashes, etc.).....	7.90	8.08	7.04	6.70
Pounds of fuel burned per hour (not deducting ashes)	404	364.09	386.35	400.12

Evaporative performance of a boiler of the locomotive type, etc.—Continued.

DAILY RESULTS—Continued.

	American coal.		English coal.	
Pounds of fuel burned per hour (deducting ashes)	360.26	324.75	359.27	373.71
Gallons of water evaporated per hour	284.93	262.59	252.94	250.51
Pounds of water evaporated per hour	2,849.03	2,625.09	2,529.4	2,505.1
Pounds of fuel burned per square foot of grate surface per hour (not deducting ashes)	21.55	19.42	20.61	21.35
Pounds of fuel burned per square foot per hour of grate surface (deducting ashes)	19.22	17.32	19.17	19.94
Gallons of water evaporated per square foot of grate surface per hour	45.2	14.01	13.49	13.36
Pounds of water evaporated per square foot of grate surface per hour	152	140.1	134.9	133.6
Gallons of water evaporated per square foot of gross heating surface per hour	.320	.295	.284	.281
Pounds of water evaporated per square foot of gross heating surface per hour	3.20	2.95	2.84	2.81

AVERAGE RESULTS.

	American coal.	English coal.
Total duration of trials on the respective dates.....hours..	17.56	17.91
Gross pounds of fuel burned (not deducting ashes)	6,722	7,041
Pounds of ashes, etc., left in ashpit at conclusion of trials	727	480
Average percentage of ashes, etc	10.81	6.81
Average net pounds of fuel burned (deducting ashes)	5,995	6,561
Gallons of water evaporated	4,795	4,590
Pounds of water evaporated	47,950	45,090
Pounds of water evaporated per pound of fuel (not deducting ashes, etc)	7.13	6.40
Pounds of water evaporated per pound of fuel (deducting ashes, etc.)	7.99	6.87
Pounds of fuel burned per hour (not deducting ashes)	382.80	393.13
Pounds of fuel burned per hour (deducting ashes)	341.40	366.33
Gallons of water evaporated per hour	273.06	251.75
Pounds of water evaporated per hour	2,730.6	2,517.5
Pounds of fuel burned per square foot of grate surface per hour (not deducting ashes)	20.43	20.97
Pounds of fuel burned per square foot of grate surface per hour (deducting ashes)	18.21	19.54
Gallons of water evaporated per square foot of grate surface per hour	14.57	13.43
Pounds of water evaporated per square foot of grate surface per hour	145.7	134.3
Gallons of water evaporated per square foot of gross heating surface per hour	.306	.282
Gallons of water evaporated per square foot of gross heating surface per hour	3.06	2.82

CHILE.

REPORT BY CONSUL McCREERY, OF VALPARAISO.

Chile receives the bulk of her coal supply from her own coal fields, situated in the center of Aranco Bay, the extent of said fields not having yet been ascertained.

The amount of the output is yearly increasing and will reach this year 600,000 tons of 1,000 kilograms each. The principal coal establishments are situated in the vicinity of Aranco Bay, and their output average as follows:

	Tons.
Compañía Esploradora de Lota y Coronel	200,000
Compañía de Aranco, limited	140,000
F. W. Schwager, Maule	80,000
Rogas, Coronel	60,000
Compañía de Lebu	60,000
Penco, Concepcion, and others	60,000
Total	600,000

The prices paid for coal per ton, free on board, at the present time, are as follows:

Lota	*$12.00
Aranco	10.00
Maule	12.00
Coronel	10.00
Lebu	8.00

The vessels engaged in carrying this coal are principally coasters under the Chilean flag, with no class; they carry coal as far north as Pisagua, and the freights which they receive range from $2.50 to $4, Chile paper currency, per ton of 1,000 kilograms, with 50 cents additional to Antofagasta, $1 to Iquique and $1.50 to Pisagua. Foreign ships rarely engage in carrying coal produced in Chile. Australian coal, especially the class called "green ticket," which costs here 12 shillings, with 20 shillings for freight to be added, has also been largely imported into Chile of late.

The amount of coal shipped from the United Kingdom and Australia to the west coast of South America, is as follows:

	Tons.
1886	185,455
1887	225,107
1888	500,226
1889	360,375

The State railways alone consume more than 175,000 tons of coal per year, which is almost entirely produced in Chile.

WM. B. MCCREERY,
Consul.

UNITED STATES CONSULATE,
Valparaiso, October 18, 1890.

COQUIMBO.

REPORT BY CONSUL GRIERSON.

Coal imported in 1889 from Great Britain, Australia, and other British sources, 23,599 tons; from southern mines of Chile, 11,308 tons; total, 34,907 tons.

The British colonial vessels bringing coal generally take homeward cargoes of nitrate, guano, manganese, sugar, etc. I have no means at present to enable me to give the extent and value of the coal fields which exist and are being opened.

Besides regular sailing coasters, some of the smelting establishments have steam colliers carrying coal and ores along the coast.

J. GRIERSON, *Consul.*

UNITED STATES CONSULATE,
Coquimbo, October 20, 1890.

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*Chilean paper currency, worth 50 cents, American, per dollar.

IQUIQUE.

REPORT BY CONSUL MERRIAM.

The coal consumed in this consular district is obtained exclusively from Great Britain and Australia, and from the south of Chile. The Chilean coal is of inferior quality and abounds in slate. When used in the manufacture of nitrate of soda it is mixed with English coal, generally in the proportion of 1 to 3.

The amount of English coal consumed in Iquique and in the nitrate establishments dependent upon it from the 1st of January to the 30th of October of this year is as follows. The ton is of 1,016 kilograms, or 2,208 pounds avoirdupois:

	Tons.
West Hartley	85,680
Australian, green ticket	22,800
Orrell steam	10,200
Patent fuel from Cardiff, for use on the railroads	14,200

The price in Iquique of the Orrel steam, during the period named, has been on an average 36 shillings, and of the other three kinds 42 shillings.

I have not been able to obtain the prices at the places of export.

The trade is in the hands of a few large importing houses, who either import the coal direct on their own account or who buy the cargoes in Valparaiso of the importers there resident.

Of the 80 sailing vessels that brought the aforesaid coal to this port, 42 were British, 21 German, 13 French, and 4 Norwegian.

I can offer no encouragement to our American producers as to a successful competition with the English at present. Accustomed to the use of English coal, proprietors of foundries, of large manufacturing establishments, have their fire grates made to suit the English coal, which comes in much larger pieces than our anthracite. For this reason foreign men-of-war always buy English coal, preferably Cardiff, as being less smoky, rather than anthracite, for which their grates are not adapted.

J. W. MERRIAM, *Consul.*

UNITED STATES CONSULATE,
Iquique, November 10, 1890.

ECUADOR.

REPORT BY CONSUL-GENERAL SORSBY, OF GUAYAQUIL.

The consumption of coal here is limited, what is consumed coming from England and Australia, and of the best quality.

About 6,000 tons are consumed per annum; and cost, delivered here, about $18 United States gold. It is brought by sailing vessels, German and English, at an average cost of 36 shillings per ton.

It is thought that valuable coal mines exist in the interior, but in the absence of railroads they can not be developed.

WILLIAM B. SORSBY,
Consul-General.

UNITED STATES CONSULATE-GENERAL,
Guayaquil, September 22, 1890.

REPUBLIC OF COLOMBIA.

BARRANQUILLA.

REPORT BY CONSUL NICKEUS.

All coal used in this district is obtained in England.

The kind used is "patent fuel" and Smith's coal; of the former about 30 tons monthly, and of the latter about 2 tons.

English smith's coal and patent fuel cost from 11 shillings to 14 shillings 6 pence per ton in England. Freight is about 20 shillings per ton sailing vessel, and duty here $4 in paper (which equals $2 in gold) per ton, making total cost here 39 shillings 6 pence to 42 shillings 6 pence, or between $10 and $11 per ton in gold.

The coal business is conducted solely by the Barranquilla Railway and Pier Company. As far as I am able to learn there is not another concern engaged in the coal trade in my district.

The vessels usually engaged in this trade are German sailing vessels.

All of the coal brought into this district is used by the Barranquilla Railway Company. No vessels coal at any of the ports in this district. The fifteen steamers navigating the Magdalena River use no coal, wood being furnished them along the shore very cheaply.

JOHNSON NICKEUS,
Consul.

UNITED STATES CONSULATE,
Barranquilla, November 10, 1890.

CARTHAGENA.

REPORT BY CONSUL CROFT.

In answer to the Department Coal Circular of August 15, 1890, I have to state that my predecessor (W. B. Mac Masters) collected much information on this subject, and from the notes of his explorations and other sources I made the following report:

COAL MEASURES.

Coal *in situ* is found in large masses back of Rio Hacha, near the banks of the Sinu and Atrato rivers, and in at least two localities between these two rivers, but is not actually mined in any of those places.

The reasons for this are two: First, the Colombian Government has conceded to one man the sole right to mine coal for a series of years in all localities where coal is to be found near the Atlantic seaboard on Government lands or on lands bought from the Government, binding himself to pay 22 per cent of the profits on this privilege. Second, the only localities where coal in paying quantities is to be found on private lands (the titles to which are older than the concession above referred to) are controlled either by my predecessor or by a New York syndicate.

Owing to these two monopolies no coal is mined near the seaboard of this country. Although rich, inexhaustible veins of coal exist at distances varying from 1 to 50 miles from the coast.

COAL CONSUMPTION.

No coal is used for manufacturing purposes in this consular district. The few small manufactories which exist here, as well as the river steamboats, use wood instead of coal. The only consumption of coal is by the Government revenue cutter, the harbor tugboats, and a few blacksmiths. The small amount of coal used by them comes from England.

As the custom-house here levies a duty of $12.50 per ton on all coal imported for consumption here, the use of foreign coal is practically prohibited, while the 22 per cent charged for the privilege of mining native coal effectually prevents any attempt to open same.

C. I. CROFT,
Consul.

UNITED STATES CONSULATE,
Carthagena, Colombia, September 30, 1890.

PANAMA.

REPORT BY CONSUL-GENERAL ADAMSON.

All of the coal imported into this consular district is consigned to and is chiefly for the use of the steamship lines connecting with this port and of the Panama Railroad Company.

The Pacific Mail Steamship Company uses at Panama about 25,000 tons per annum for the supplying of its steamships of the San Francisco, Mexican, and Central American lines. All, or nearly all, of this is brought from the eastern coal fields of the United States on British "tramp" steamships, because of the cheaper freight, and is landed at the port of Colon on the Atlantic side of this isthmus and thence by railroad 47 miles to Panama. The agent of the company said the prices paid for it were the current rates of the market at dates of purchase but he had not bills at hand to give the exact figures.

The Pacific Steam Navigation Company, which is a British company,

running steamers between Panama and Valparaiso, with calls at intermediate ports, uses about 4,000 tons a year at Panama, all of which is Cardiff coal. The agent referred me to the head office at Callao for particulars as to cost, freight, etc.

The South American Steamship Company's vessels, sailing under the flag of Chile and making same voyages as those of the Pacific Steam Navigation Company, do not coal at this port, as they bring enough with them from the southern ports to make the return trip.

The Panama Railroad Company uses at Panama about 8,000 tons a year and sells from 600 to 1,000 tons to local purchasers for the use of two small steamers in the near coast trade, for the steam engines used in local industries, and an occasional supply to a foreign vessel of war. The Panama Railroad Company imports only Cumberland soft coal, shipped from Newport News to Colon on American sailing vessels and British "tramp" steamships, and transported by rail from Colon to Panama. The average selling price at Panama is $15 per ton in United States gold.

From the foregoing it will be seen that the total consumption at this port and the amount supplied to outgoing steamships is 38,000 tons a year.

There are no coal fields in this consular district.

THOMAS ADAMSON,
Consul-General.

UNITED STATES CONSULATE-GENERAL,
Panama, September 19, 1890.

URUGUAY.

REPORT BY CONSUL HILL, OF MONTEVIDEO.

The coal consumed here is Welsh, North of England, and Scotch, most of the commodity coming from Cardiff, Newcastle, and Glasgow. The consumption amounts approximately to 300,000 tons per year. At any one time there are perhaps 20,000 tons on hand. At the places of export the price per ton is 16*s.* to 17*s.* delivered on shipboard. Freights vary greatly, having in the past been momentarily as high as 35*s.*, and have declined as low as 16*s.* 6*d.* Freight now 21*s.* or 22*s.* per ton from the place of export to Montevideo. Freights to Paysandu and Salto, on the Uruguay River, are somewhat, but not greatly, in excess of these figures. All kinds are worth $12 to $13 per ton in Montevideo.

The coal is landed in bags by lighters, delivering about 1,000 tons per day of twenty-four hours. This work is sometimes interrupted by severe weather, especially during the winter months (June, July, and August).

The trade is in the hands of various nationalities. Mr. W. D. Evans, an American, is one of the leading, perhaps the foremost, importer of coal.

Nearly all the coal is brought in English and Norwegian bottoms.

There are no coal mines in operation in the country. Whether any deposits exist is very problematical. The progress of this country has proceeded no further than a speculative frenzy, which has culminated and broken, and meanwhile the resources, agricultural and mineral, have been neglected.

F. D. HILL,
Consul.

UNITED STATES CONSULATE,
Montevideo, November 4, 1890.

VENEZUELA.

LA GUAYRA.

REPORT BY CONSUL BIRD.

In a tropical climate like this of Venezuela the use of coal is of course very much restricted, and this is more especially so since there are no manufacturing enterprises in the country, and that for cooking and other ordinary purposes charcoal is universally used. The establishment four years ago of a gas plant in the city of Caraças, and the slow development of some short railway lines since 1883 have caused a small trade in coal to spring up, the importation of which prior to that period was almost unknown.

The coal chiefly imported here consists of patent fuel, or coal screenings pressed into rectangular blocks and cones, in British, Norwegian, and Danish sail vessels, from Cardiff, Wales. Out of a total import during the present year of about 7,500 tons, the amount of 4,800 tons is comprised of this fuel from Cardiff, which is exclusively used for railway locomotives. Two cargoes of 573 tons, recently imported, cost $1,995.26 in Cardiff, or about $3.46 per ton, upon which the freight per sailing vessel was $4.13 per ton. It should be observed that there is no duty upon coal. All these values are stated in American gold.

Of the balance of coal imported, say 2,700 tons, about half comes from Newport News, Virginia, and is known as cannel coal, while the remainder is bituminous coal from New York. It comes in American sail and steam vessels, and is used by the Caracas Gas Company. The prices of American coal and the freight rates from the United States could not be ascertained at the agency of the gas company in this city.

A good, lumpy bituminous coal, well adapted for all steam purposes, and also an excellent coal, almost all lumps, and suitable for both gas and steam, can be placed free on board at Philadelphia for $2.65 and $3.25 per ton, respectively. Freight rates are quoted at $3 to $3.25 per ton; so it would appear from these figures, all of which have been carefully verified, that a good American coal can be laid down here at lower figures than the Cardiff article.

There is no retail trade in coal at this port, the importations being made for the La Guayra and Caracas Railway, the Venezuelan Central Railway, the Grand Railway of Venezuela, and the La Guayra Breakwater Company.

The only coal field in this consular district that is being developed is located near Barcelona, Venezuela, about 135 miles east of La Guayra, on the Caribbean Sea. Information with respect to the extent and value of these coal deposits was communicated to the Department of State in my report upon the commerce of Barcelona, dated April 8, 1890, from which it will be seen that there exist there large quantities of good bituminous coal easily mined and accessible to the sea. And upon the anticipated early completion of the railway from these mines to the port of Guanta, it is probable that there will be no farther foreign demand for this class of coal. It is known that the failure of the Panama Canal enterprise is a serious blow to this coal company, since it was expected that the demand for coal on the isthmus would be supplied from this source.

WINFIELD S. BIRD,
Consul.

UNITED STATES CONSULATE,
La Guayra, October 4, 1890.

MARACAIBO.

REPORT BY CONSUL PLUMACHER.

There is absolutely no importation of coal at the port of Maracaibo. The universal fuel is wood (for household purposes, charcoal). A small quantity of bituminous coal was formerly introduced from the United States for the use of the tugboat, but even this has long ceased, and at present no mineral coal is imported or used in this district. The practically inexhaustible forests of this section offer a constant supply of fuel for all purposes, much cheaper than would result from the introduction of coal.

There are, moreover, within easy reach of this city, large fields of an excellent bituminous coal, the working of which would be easy and unattended with serious cost.

In a former report I explained in detail the location and character of these deposits.*

I have since received many inquiries from parties in the United States respecting these most valuable fields of mineral wealth, and hope that their development may be due to American capital and enterprise.

It is certain that they will not be allowed to remain idle and unpro-

* Republished herewith.

ductive much longer, and there are large profits awaiting the pioneers in this industry.

E. H. PLUMACHER,
Consul.

UNITED STATES CONSULATE,
Maracaibo, October 14, 1890.

COAL DEPOSITS OF VENEZUELA.

[From Consular Report No. 94.]

It is the abundance of carboniferous deposits, however, which gives the greatest importance to the territory explored. At little more than the distance of 1 kilometer from the river Tulé, near Los Ranchos de Guasdual, was found the first view of coal among the many discovered during the exploration. From this point, for a distance of 5 kilometers, exist fourteen veins more of the same mineral visible in the banks of the river, many of them measuring from 10 to 30 feet in diameter, and with an apparent direction of NNE. and SSW. A number of these veins traverse the bed of the river at a depth of more than 3 meters, and it is probable that they extend a long distance on the other side.

Continuing the exploration along the river for a distance of 10 kilometers it may be confidently asserted that its banks, as far as the foot of the sierra, are an almost homogeneous composition of the same mineral visibly cropping out with scarcely any interruption. These croppings are also visible at various points of the banks of the creeks which empty into the Tulé and Riocito, and abound in the last-named river for a distance of more than 12 kilometers.

In view of these facts it may be safely affirmed that in that part of the territory of the State included between the Sierra de Tulé, the river of the same name, the Sierra de Guasdual, and a line drawn from the extremity of the latter to the Sierra de Tulé, there exists a carboniferous formation which occupies an approximate area of 300 square kilometers.

Three of these coal veins are in constant combustion, the causes for which, and the date of commencement, are unknown. The first of these three is situated on the right bank of Algibe Creek, about 1 kilometer from Los Ranchos de Guasdual. It does not eject either smoke or flame and its state of combustion is revealed only by the elevated temperature of the spot.

The second ignited vein is upon the left bank of the river Tulé, 6 kilometers distant from the before-mentioned Ranchos de Guasdual. At a distance of 15 or 18 feet above the level of the river there is a small fissure, measuring about 18 by 6 inches, from which smoke is constantly issuing. To the right and left of this crevice are several smaller ones, which do not eject smoke, but which give out an intense heat, showing the activity of the combustion.

The third vein is found close to the sierra, on the bank of a creek, and a short distance from the river Tulé. From it smoke is constantly issuing, accompanied frequently by flames, whose brilliancy it is said may be distinguished on clear nights from localities only a few miles west of Maracaibo. Many circumstances unite to confirm the belief that this is the volcano heretofore mentioned. All this coal is of one quality, and of the bituminous variety. It is very similar to the cannel coal of England, although perhaps of less density, and containing less bitumen, and appears free from sulphur and other substances which many other coals contain. It burns freely in the open air almost without smoke or sparks, producing a bright and clear flame, with a sufficiently intense heat. It does not "clink" or disintegrate to any great extent in the process of combustion, and leaves a very small residue of ashes. It is believed that this coal is far superior to any other as yet discovered in Venezuela, and it is to be regretted that the State has not sufficient resources to undertake the working and development of this wealth, lying less than 100 kilometers from Maracaibo.

No mine in Venezuela offers advantages equal to those of Tulé, not only on account of the excellent quality and extraordinary abundance of the coal, but also from the facility of working. All the veins are found at such a slight depth below the surface that nothing more than trenches are needed for their development. In only one locality, and for but a short distance, would galleries be necessary, and these could be easily run both straight and transversely, and in no part of the carboniferous territory would it be necessary to erect machinery to raise the coal to the surface.

Upon considering the extraordinary size of the veins of coal which cross the river Tulé, the idea occurs that the beginning of this extensive carboniferous formation may be found at a considerable distance, and it would be interesting to decide the following questions:

1. To what distance do the croppings to the north of the river Riocito extend?

2. Whether the Sierra de Tulé contains coal deposits equal or similar to those already discovered.

3. Whether the carboniferous formation extends to the south of the river Tulé as far as the Sierra of Perija?

If the formation is also found in the last-mentioned range there can be no doubt that there is the basis of all these deposits. In the department Guzman Blanco, bounded by the lake, the rivers Palmar, Santa Anna, and Sierra de Perija are found a considerable number of asphalt deposits, and a coal formation at the foot of the sierra, visible in two large crossings situated south of the town of Machiques, between Rio Negro and Santa Anna.

At La Paja, near the river Apon, pieces of amber have been discovered, but no special investigations have been made respecting the possible abundance of this substance.—E. H. PLUMACHER, *Maracaibo, February, 1889.*

WEST INDIES.

BRITISH WEST INDIES.

ANTIGUA.

REPORT BY VICE-CONSUL GAWRAITH.

There are no coal fields in this consulate. The imports of coal (Welsh and Scotch steam) into Antigua for the years 1887, 1888, and 1889 were as follows: From the United Kingdom, 2,947 tons; from Barbados, 121 tons; from St. Thomas, 100 tons; total, 3,168 tons.

Freight, 10 shillings 6 pence to 15 shillings per ton.

Duty, 2 shillings 1 penny, and 12 per cent on duty.

Lighterage, 1 to 2 shillings per ton.

Sold at from 30 to 35 shillings per ton.

The coal is usually brought in Norwegian vessels, in bulk, and discharged from alongside by importer or purchaser, and stored in open yards; 2,240 pounds to the ton.

Messrs. G. W. Bennett & Co. are the principal importers.

SAMUEL GAWRAITH,
Vice-Consul.

UNITED STATES CONSULATE,
St. John, Antigua, October 6, 1890.

BARBADOS, ST. VINCENT, AND ST. LUCIA.

REPORT BY CONSUL DIMMICK, OF BARBADOS.

BARBADOS.

The consumption of coal in Barbados (including coal shipped to steamers) is on an average 20,000 tons per year.

The coal brought to this island is obtained chiefly from Cardiff, Wales, and Scotland.

The buying price varies from $2 to $3 per ton, according to quality at place of shipment. The selling price varies from $8 to $9 per ton. The duty is 60 cents per ton.

The coal business in this island is carried on chiefly by M. Cavan & Co., who import their coal from Cardiff. Among others who engage in the coal trade may be mentioned Thomas Daniel & Co., H. E. Thorne & Son, and Samuel Manning.

Coal is extensively used in this island by sugar cane planters for plantation use. Scotch coal is chiefly used for this purpose and hard and lumpy coal is preferred.

The coal is chiefly brought to the island by European sailing vessels, but sometimes by steamers.

No local coal mines are worked, but deposits are found in the central part of the island, known as the Scotland district.

ST. VINCENT.

The entire consumption of coal in St. Vincent for the year ended December 31, 1890, was 105 tons. Of this quantity 46½ tons were imported in hogsheads from London by steamers, 58 tons were sent from Barbados, and one-half ton was imported from St. Lucia. The bulk of the coal imported is of the sort known as smith coal and is used exclusively in blacksmiths' work. There are only a few steam sugar factories in the island and they rarely use coal on account of the expense attendant on doing so.

The cost is determined by the price of coal in Barbados.

The importation of smith coal from London has been almost stopped, as the rate of freight charged by the steamers leaves no margin of profit to the importer.

ST. LUCIA.

The coal used in St. Lucia is obtained chiefly from Cardiff and Newport, Wales, with occasionally a small cargo from the north of England and the United States. The quantity of coal imported there during the year ended December 31, 1890, was 45,831 tons, arrived at thus: United Kingdom, 44,863½; British West Indies, 967½; total, 45,831; while the amount exported during the same period was 38,348 tons, leaving a balance of 7,483 tons, which has been consumed in the colony chiefly by the sugar factories. The buying price varies considerably during the course of a year. In Wales it is now about $3.48 per ton.

The freights from Cardiff have varied from $2.52 to $2.98 per ton by steamers, and up to as high as $3.60 by sailing vessels.

The export trade consists chiefly in the supply of what is termed bunker coal to steamers. This coal is supplied to the merchants in St. Lucia by agents in England who make yearly contracts with the colliery owners. These agents on behalf of the merchants in St. Lucia make yearly contracts with the steamship owners for coal supplies to their vessel at Port Castries, St. Lucia. The principal firms engaged in the trade are Peter & Co., Barnard, Peter & Co., and Menville & Chastagt. The contracts with the steamers stipulate for the supply of Welsh steam coal.

There are no coal mines in St. Lucia nor any coal deposits.

Port Castries, St. Lucia, is one of the principal coaling depots in these waters, and the trade is supposed to be increasing.

E. A. DIMMICK,
Consul.

UNITED STATES CONSULATE,
Barbados, June 8, 1891.

BERMUDA.

REPORT BY CONSUL BECKWITH.

The anthracite coal, which is used here only for household purposes, is imported from the United States, mainly from New York.

The bituminous coal, which is used for all general coaling purposes, is imported chiefly from Cardiff, Wales. The importers prefer the English to American coal, for the reason that it is not so slack—that is, the English is more lumpy and burns better. In case of unexpected shortage, however, cargoes of bituminous coal have been brought here from the United States, chiefly from Newport News.

The amount of anthracite used yearly is about 1,000 tons, and of bituminous about 3,000 to 4,000 tons. These figures vary of course, according as the severity of the winter, causing more or less vessels to call for coal.

The price of American anthracite at place of delivery is $8.50 per ton; the price of Cardiff bituminous at place of lading is $3.50 and at place of delivery $8.25 per ton. The price of Newport News coal at place of delivery is $6.50 per ton.

Business is carried on between agents for coal companies at points of shipment and merchants here in Bermuda, who have organized two coal companies.

The coal is shipped direct from England here in full cargoes, and is then retailed out here. This coal is sometimes shipped in "tramp" steamers, but generally in large sailing vessels, and the great majority of these vessels are either of Scandinavian or Norwegian nationality. This, of course, is the bituminous coal.

The anthracite coal is brought direct from New York in the British mail steamers regularly plying between that port and Bermuda.

The above report and statistics do not include the coal brought here and used by the British Government. This coal is also brought from Cardiff and other English ports in Government transports, and kept solely for the use of the army and navy. It is, of course, purchased by contract. I am unable to get any statistics or details in regard thereto.

There are no coal fields whatever on these islands. All coal is imported.

HENRY W. BECKWITH,
Consul.

UNITED STATES CONSULATE,
Hamilton, Bermuda, October 16, 1890.

JAMAICA.

REPORT BY CONSUL ESTES OF KINGSTON.

But little coal is imported into this island except that for use of steam vessels and a few engines on land.

Custom-house returns for the year ending September 30, 1889, show coal and coke imported from the United Kingdom, 44,358 tons, value, £32,268 1*s.*; from United States 250 tons, valued at £187 17*s.* 6*d.* The coal comes principally from Cardiff in Norwegian schooners, and the freight steamers of the Royal Mail Steamship Company only for their own use.

W. R. ESTES,
Consul.

UNITED STATES CONSULATE,
Kingston, Jamaica, October 3, 1890.

NASSAU.

REPORT BY CONSUL M'LAIN.

No regular trade in coal is carried on in this colony, nor is there any person here who imports or handles coal as a business. Our supply depends on what is salved from the cargoes of vessels wrecked in these waters. I have no recollection of a single cargo of coal being imported for sale during my twelve years service here.

The coal used here is American, sometimes hard, sometimes soft, and when any sales are made the price is about $12 per ton to some passing ship. The amount sold might average 100 or 200 tons per annum

There are no coal fields in the colony.

The entire absence of manufactories, railways, etc., which require coal, operate against the establishment of any profitable trade in that article with this colony.

THOS. J. MCLAIN, JR.,
Consul.

UNITED STATES CONSULATE,
Nassau, New Providence, September 17, 1890.

TRINIDAD.

REPORT BY CONSUL PIEROE.

So far as known, there are no mineral coal fields in this consular district of sufficient importance to be worked as such. There is more or less conjecture that coal beds exist, and I understand that a movement is now being made to develop the matter. In certain localities a substance understood to be coal is obtainable, but up to the present time the expense of obtaining it has been too great for the results.

The carrying trade in coal to this consular district is not sufficiently large to induce vessels to specially engage in it. On the contrary, importations of coal are largely incidental to other matters. A vessel bound from a coal-producing country to the West Indies without cargo, or insufficiently loaded, is apt to complete her complement of cargo with coal, without regard to the usual differences in the price and quality of coal, for the reason that the alternative is presented of carrying to the West Indies a safe commodity (though it be at reduced freightage) upon the one hand, or of carrying an insufficient load or coming empty upon the other. It is believed that this alternative more frequently presents itself to vessels proceeding from Europe than to those proceeding from the United States. The tonnage of freight passing from Europe to the West Indies, thence (enlarging) to the United States, thence (again enlarging) to Europe is much greater than the tonnage of freight passing the same circuit on the reverse order, and it is understood that vessels proceeding from Europe for American exports not unfrequently proceed by way of the West Indies, carrying coal thereto at reduced freightage with a view to better freightage therefrom to the United States.

The following tables, compiled from the custom-house records, will show, in a general way, the condition of the coal trade at Trinidad. The values stated are the invoice values, but as there is no import duty here on coal or patent fuel the valuations are believed to be, to some extent, the results of impromptu estimates. The tables relate only to the Island of Trinidad, but the other part of this consular district (Tobago) imports very little coal direct from coal-producing countries—only 50 tons last year:

COAL.

Whence imported.	1886.		1887.		1888.		1889.*	
	Tons.	Value.	Tons.	Value.	Tons.	Value.	Tons.	Value
United Kingdom	13,503	£12,586	17,761	£17,499	13,910	£13,903	13,887	£13,158
United States	952	952	2,176	1,796	776	756	978	648
British West Indies	1,032	977	20	†12	.....	.....	.....	.....
British Guiana	120	150	.....	.....	.....	.....	.....	.....
Germany	100	100	.....	.....	.....	.....	.....	.....
Dutch West Indies	130	130	.....	.....	.....	.....	.....	.....
France	.....	.....	40	40	.....	.....	.....	.....
Spain	.....	.....	104	104	.....	.....	.....	.....
French West Indies	.....	.....	.....	.....	.....	.....	2	3
Total	15,837	14,895	20,101	19,451	14,688	14,662	14,765	13,806

PATENT FUEL.

United Kingdom	12,083	£13,431	13,359	£18,460	13,544	£14,969	20,320	£25,083
France	100	100	30	50	150	150	250	360
Germany	510	560	.....	.....	60	49	.....	.....
Venezuela	.....	.....	.....	.....	2	2	.....	.....
Total	12,693	14,091	13,389	18,510	13,756	15,170	20,570	25,443

* The custom-house figures for 1889 embrace both coal and coke.
† And, in addition, £6 worth of coke.

The tendency, as the table indicates, seems to be to use patent fuel instead of coal. The patent fuel (Crown patent fuel of Cardiff) costs about 50 or 75 cents per ton more than coal from the United Kingdom, but the advocates of the patent fuel claim that the waste (coal dust) and trouble incidental to moving coal fully makes up for this difference.

I beg to add that the Orinoco Steamship Company, with the principal office at this place, is now using the Pocahontas coal from Norfolk, Virginia, with very satisfactory results. I am also advised that in the usual course of trade, original price, freight, and insurance all considered, it costs about 50 cents less per ton to deliver at this place the Pocahontas coal than it does the coal from the United Kingdom; total cost of the one being about $5.50, that of the other about $6.

WM. P. PIERCE,
Consul.

UNITED STATES CONSULATE,
Trinidad, November 8, 1890.

DUTCH WEST INDIES.

CURAÇOA.

REPORT BY CONSUL SMITH.

The little coal that is being imported here comes from the United States and England.

The coal from the United States, anthracite and bituminous, is imported by me in American vessels, and the Cardiff coal by Messrs. Leon V. Leyba & Co., in British vessels, and this last mostly under contract for the use of the Dutch man-of-war stationed here. Both are being sold at from $10 to $12 a ton, costing about $3 to $4 at the ports of delivery.

L. B. SMITH,
Consul.

UNITED STATES CONSULATE,
Curaçoa, West Indies, September 23, 1890.

FRENCH WEST INDIES.

MARTINIQUE.

REPORT BY CONSUL KEEVIL.

The coal consumed in this consular district is imported from the following countries: England (Newcastle), Scotland (Glasgow and Troon), Wales (Newport), Nova Scotia, and the United States, in quantities of about two-thirds from first-named countries, and one-third from America.

The amount consumed annually is about 70,000 tons of bituminous coal, in nearly the following quantities for the different uses: Factories (sugar) and distilleries, 20,000 tons; government uses, 10,000 tons; French transatlantic steamers (mail line), 40,000 tons.

The cost of the coal, freight included, is (average price) $5.35 per ton, delivered alongside. The import duty, all told, 3.15 francs per ton; lighterage, 4 francs per ton. It sells on the wharf at prices varying from $6.75 to $8.68 per ton. The present quotation is $8.10 per ton. The coal from England is twice screened hard coal. American coal at

present is selling at nearly the same prices as English, and if coal shipped from the United States was as hard as the coal from England, and as well screened, it would be preferred, as it is believed by consumers to possess better steam qualities, and freer from sulphur. From some experience in steam coals, I would suggest that an article similar in quality to that mined in the vicinity of Pittsburg, and southern Kentucky would best suit this market. Soft coal, on account of being affected by the heat and moisture of this climate, is objected to, as the native firemen are not experienced enough to use it economically, and consequently great waste is the result.

The largest and most reliable importers of coal at this port of St. Pierre are as follows: Messrs. C. Aries & Co., Plissoneaux & Co., Borde & Sons, fils., L. Girard & Co., G. Berte, and H. Collins & Co.

ALFRED B. KEEVIL,
Consul.

UNITED STATES CONSULATE,
St. Pierre, Martinique, West Indies, December 20, 1890.

HAITI.

REPORT BY CONSUL-GENERAL DOUGLASS.

1. The coal consumed in Haiti is obtained in Lancashire, England, in Cardiff, Wales, and in the United States.

2. It is estimated that about 6,000 tons of different qualities of coal are consumed here annually.

3. The prices paid for it in England and Wales vary from 10 to 15 shillings per ton; in the United States the price paid is about $2.75 per ton. The prices in Haiti vary from $12 to $14 per ton.

4. The purchases are generally made through commission merchants.

5. Coal is brought to this country in sailing vessels, generally under the Swedish or German, rarely under the English flag.

6. The freight per ton from England and Wales varies from 11 to 14 and even 15 shillings per ton; from the United States it is $3 per ton.

7. The coal imported here is used almost exclusively for the Government vessels and the coast-line steamers of B. Rivière & Co.

8. English and Welsh coal seems to be preferred rather than that of the United States.

9. Although B. Rivière & Co. pay no customs duty on the coal imported by them, their coast line of steamers being subsidized by the Government, the Haytien tariff lays an import duty on coal of $1.83⅓ on each boucaut, the boucaut being accepted as half a ton or 1,000 pounds.

FREDERICK DOUGLASS,
Consul General.

UNITED STATES CONSULATE GENERAL,
Port au Prince, December 18, 1890.

SAN DOMINGO.

PUERTO PLATA.

I have to report in answer to coal circular of August 15, 1890, that no coal is used or mined in this district.

THOS. SIMPSON,
Consul.

UNITED STATES CONSULATE,
Puerto Plata, September 22, 1890.

SPANISH WEST INDIES.

CUBA.

CIENFUEGOS.

REPORT BY CONSUL EHNINGER.

The following table will show the place of export, amount and kind of coal imported into this consular district during the fiscal year ended June 30, 1890:

Flag.	Port whence proceeding.	Designation of coal.	Amount.
			Tons.
English steamship	Leith, Great Britain	Steamer coal	2, 156. 91
Do	Glasgow, Great Britain	do	8, 904. 19
Norwegian bark	Troon, Great Britain	do	1, 203. 59
Do	Cardiff, Great Britain	do	716. 68
Do	Newport, Great Britain	do	675. 40
American sailing vessels	Philadelphia, Pa	Westmoreland, Cumberland, and Georges Creek.	14, 852. 74
Do	Baltimore, Md	do	4, 555. 75
Do	New York	Bituminous	663. 46
Total importation			28, 728. 72

At the port of Trinidad de Cuba 713 tons were imported during same period in two American vessels, both from Philadelphia.

The consumption during the past fiscal year was as follows:

1. Coasting steamers of Menendeg & Co., 6,000 tons (viz, 4,000 of Westmoreland and 2,000 of Cardiff).

2. Railroad company from Cienfuegos to Santa Clara, 5,000 tons (Westmoreland).

3. Gas company of Cienufgos, 2,500 tons (Cumberland and Westmoreland).

4. Sugar plantations in this district, 7,000 tons (Cumberland, Westmoreland, and Georges Creek).

The above are the principal consumers. The remainder is taken by steamers touching here, river steamers, and by industrial works such as foundries.

The prices are, for English coals, varying from 10 shillings 9 pence to 14 shillings 9 pence per ton. Freights, 8 shillings 6 pence to 10 shillings. For American coals, $2.70 to $3.45 per ton; freights, $2 to $2.50.

The custom-house duties amount to 72 cents per ton. An effort is

being made to have this duty removed or reduced, in view of the great necessity for coal in the sugar plantations.

No coal fields have been discovered in this consular district, nor have I heard of any in other parts of the island.

The consumption of coal on sugar plantations will be much larger owing to the difficulties of obtaining wood for fuel.

HENRY A. EHNINGER,
Consul.

UNITED STATES CONSULATE,
Cienfuegos, October 13, 1890.

MATANZAS.

REPORT BY VICE-CONSUL HEIDEGGER.

The coal consumed in this district is imported from the United States and Great Britain, as appears by the inclosed statement showing the quantity of coal imported at this port during the past five fiscal years, viz, from July 1, 1885, to June 30, 1890.

The kind of coal consumed here is generally bituminous; hard coal, such as anthracite, has thus far not found any application.

At places of production British coal averaged in price from 6 to 15 shillings ($1.44 to $3.65) per ton. The last price is for cannel coal, used for gas manufactories. American bituminous coal has averaged from $1.80 to $3.50 per ton. At this port coal has sold during the last five years from $5 to $9 per ton, delivered on shore.

As to the manner in which the business is conducted here and by whom, I beg to state that it is in the hands of three warehousemen (owners of sugar and molasses stores), and one lumber dealer, which parties sell to sugar-estate owners, steamers, and the different railroad companies. The Matanzas Railroad Company, whose central office is in this city, also imports direct from Europe and the United States large quantities of coal for their own consumption; their direct imports for the past five fiscal years amounted to 34,752 tons.

Regarding the nationality and class of vessels engaged therein, and consumption of said articles, reference is hereby respectfully made to the inclosed statement. You will observe by said statement that the consumption has increased yearly. The duty on coal was only 57 cents per ton, but now, according to the new tariff in force since July 1 of the present year, it is $1.72 per ton. The general opinion is that this increase will diminish consumption.

The use of bagasse burners introduced lately on sugar estates, for burning green bagasse, will also probably cause a decrease in the consumption of coal.

I have not heard of the working of any local fields in this district, though I am of opinion that they exist.

Statement showing the imports of coal at Matanzas during the five years ended June 30, 1890.

Flag.	AMERICAN (UNITED STATES) PORTS.				
	New York.	Philadelphia.	Baltimore.	Boston.	Portland, Me.
	Kilos.	*Kilos.*	*Kilos.*	*Kilos.*	*Kilos.*
American (United States)	25,641,830	71,396,405	10,056,551	449,645	47,004
British	1,434,685	5,807,152	2,522,500	.....	.....
Norwegian	788,416	.....	.....	.....	.....
Total	27,864,931	77,203,557	12,579,051	449,645	47,004

Flag.	AMERICAN (UNITED STATES) PORTS.			
	Norfolk.	New Orleans.	Pensacola.	Total.
	Kilos.	*Kilos.*	*Kilos.*	*Kilos.*
American (United States)	706,948	.....	3,662,000	111,960,383
British	2,452,370	60,900	.....	12,277,607
Norwegian	.....	.....	.....	788,416
Total	3,159,318	60,900	3,662,000	125,026,406

Flag.	EUROPEAN PORTS.				
	Liverpool.	Troon.	Glasgow.	Leith.	Newport.
	Kilos.	*Kilos.*	*Kilos.*	*Kilos.*	*Kilos.*
American	1,084,072	3,035,785	.....	.....	.....
British	10,825,054	23,827,282	9,941,602	3,207,836	1,218,203
Norwegian	6,670,253	5,290,028	1,377,203	.....	.....
Spanish	11,095,763	.....	.....	.....	.....
Italian	636,016	.....	.....	.....	.....
Total	30,311,158	32,153,095	11,318,805	3,207,836	1,218,203

Flag.	EUROPEAN PORTS.			
	Greenock.	Ayr.	Ardrossan.	Total.
	Kilos.	*Kilos.*	*Kilos.*	*Kilos.*
American	.....	.....	773,430	4,893,267
British	.....	1,121,575	1,882,267	52,023,819
Norwegian	4,930,413	660,400	.....	18,928,297
Spanish	.....	.....	.....	11,095,763
Italian	.....	.....	.....	636,016
Total	4,930,413	1,781,975	2,655,697	87,577,182

IMPORTS PER YEAR FROM UNITED STATES PORTS.

Year.	New York.	Philadelphia.	Baltimore.	Boston.	Portland, Me.	Norfolk.	New Orleans.	Pensacola.	Total.
	Kilos.	*Kilos*	*Kilos.*	*Kilos.*	*Kilos.*	*Kilos.*	*Kilos.*	*Kilos.*	*Kilos.*
1886..	13,661,070	2,115,968	4,380,811	.....	47,004	.....	.....	.....	22,204,853
1887..	2,536,778	6,120,002	4,424,251	.....	.....	1,073,870	60,900	.....	14,215,801
1888..	836,683	13,457,488	3,091,573	.....	.....	2,085,448	.....	.....	19,471,192
1889..	5,333,533	22,657,859	427,651	.....	.....	.....	.....	.....	28,419,043
1890..	3,496,867	32,852,240	254,765	449,645	.....	.....	.....	3,662,000	40,715,517
Total.	27,864,931	77,203,557	12,579,051	449,645	47,004	3,159,318	60,900	3,662,000	125,026,406

Statement showing the imports of coal at Matanzas—Continued.

FROM EUROPEAN PORTS.

Year.	Liverpool.	Troon.	Glasgow.	Leith.	Newport.	Greenock.	Ayr.	Ardrossan.	Total.
	Kilos.	*Kilos.*	*Kilos.*	*Kilos.*	*Kilos.*	*Kilos.*	*Kilos.*	*Kilos.*	*Kilos.*
1886..	11, 315, 573	10, 681, 002	.....	3, 207, 836	.....	.....	1, 226, 770	1, 882, 267	28, 313, 448
1887..	2, 234, 184	7, 459, 083	329, 578	.....	.....	1, 934, 792	.....	.....	11, 957, 637
1888..	4, 837, 398	7, 242, 960	1, 755, 189	.....	1, 218, 203	1, 323, 814	.....	.....	16, 377, 564
1889..	7, 702, 438	938, 875	4, 394, 973	.....	.....	.....	555, 205	773, 430	14, 364, 921
1890..	4, 221, 565	5, 831, 175	4, 839, 065	.....	.....	1, 671, 807	.....	.....	16, 563, 612
Total.	30, 311, 158	32, 153, 095	11, 318, 805	3, 207, 836	1, 218, 203	4, 930, 413	1, 781, 975	2, 655, 697	87, 577, 182

Total for the United States, 125,026,406 kilograms; total for Europe, 87,577,182 kilograms; grand total imports 212,603,581 kilograms, equal to about 206,331 tons.

HENRY HEIDEGGER,
Vice-Consul.

UNITED STATES CONSULATE,
Matanzas, September 19, 1890.

SAGUA LA GRANDE.

REPORT BY COMMERCIAL AGENT PELLETIER.

The coal consumed in this district is brought from the United States, and principally from Philadelphia. The total import of coal into this district from September, 1889, to September, 1890, is 10,920,500 tons of Westmoreland.

The price of coal at export ports varies from $2.90 to $3, and here it is sold from $6.50 to $7 a ton. This business is carried on by commission merchants, and the vessels engaged therein are generally American sailing vessels, though sometimes British sailing vessels arrive here loaded with said article.

ANTHONY PELLETIER,
Commercial Agent.

UNITED STATES COMMERCIAL AGENCY,
Sagua la Grande, ———, 1890.

PORTO RICO.

Amount of coal imported in 1889.

From what country.	Flag.	Amount.
		Kilos
England	English	4, 260, 171
Do	Spanish	1, 275, 919
Do	Norwegian	840, 697
United States	United States	2, 953, 181
Do	English	1, 839, 883
Danish Possessions	Danish	5, 720
Total		11, 196, 571
Total in tons (nearly)		11, 019

Signs of rich coal beds have been discovered in some of the mountains of the island, but from the nature of the country they are considered inaccessible and have never been investigated.

LEWIN R. STEWART,
Consul.

UNITED STATES CONSULATE,
San Juan, December 19, 1890.

SUPPLEMENT.

MEXICO.

STATE OF COHAHUILA.

ITS SITUATION, LIMITS, AND PHYSICAL ASPECT.

REPORT BY CONSUL WOESSNER, OF SALTILLO.

According to the general statistics of the Republic of Mexico the State of Cohahuila is located in longitude west of Mexico between 0° 37′ and 4° 4′, and in north latitude between 24° 31′ and 29° 55′. Its territorial extent is estimated at 131,800 square kilometers, or an area of 11,000 square leagues, as claimed by the local authorities.

The northwestern portion of the State, called "El Desierto," was formerly inhabited by savage tribes of Indians, who made frequent incursions on the villages bordering on this section, so that it has not only remained unsettled but comparatively unknown until within the past few years. It has recently been thoroughly surveyed, and an authentic map will eventually be published.

The State is bounded on the north by the United States of America, from which it is separated by the Rio Grande (Rio Bravo del Norte). It is bounded on the east by the States of Tamaulipas and Nuevo Leon, on the south by San Luis Potosi and Zacatecas, and on the west by Durango and Chihuahua. Its population is estimated at 150,000 inhabitants.

In the central and southwestern portions are extensive prairies and fertile valleys, adapted to profitable cultivation and stock-raising. The "Laguna" district especially is a section of the most prodigal exuberance and one of the richest agricultural portions in the State, and even of the Mexican Republic. Its alluvial soil, composed of clay and sand, with an admixture of calcareous substances, renders it of easy cultivation and preserves a sufficient degree of nutritious moisture for the prompt germination of seeds and a rapid growth of the plant. From 1 bushel of corn 300 bushels may be easily grown, and one bushel of wheat will produce 100; while cotton, which is the chief industry in this portion of the State, gives a net profit of from 75 to 150 per cent, according to its proximity to the Rio Nazas. With the exception of the plantations of Hornos, which were formerly the property of the Jesuits of the Colegio de Parras, this extensive tract of land at one time belonged in most part to the marquisate of Aguayo.

For the sum of $250.12½ the royalty of Spain granted to the Marquis of Aguayo and Santa Olaya 115¼ sitios of sheep-grazing lands and 28 sitios of cattle pasture (in all about 246,287 acres), of which Don Juan

de Ortosum took possession in the name of the Marquis Don Francisco de Urdiñola, sr., styled also Captain of Mazapil and conqueror of this portion of Mexico.

The surveys which were made in April, 1731, by Don Prudencio de Basterra, mayor of Parras, began in the valley known as Espiritú Santo, and terminated 200 chains beyond the ancient bed of the Rio Nazas, touching the foot of the fortress of Mapimi.

The northwestern portion of the State of Cohahuila may be classified topographically under four principal heads, viz: Mountains, table-lands, hills, and plains, which will be treated separately.

MOUNTAINS.

There are six distinct chains of mountains that bound or traverse the northern territories of the State; they are the Serranias del Carmen, Serranias de la Catedral, Cerros de San Geronimo, Serranias del Nevada, Sierra del Consuelo, and Sierra del Bravo, the last-mentioned five ranges bearing local or State names.

Las Serranias del Carmen.—This range forms the southern limit of this country from the peak of the Centinela to the Boquillas, a distance of 33,320 meters, or 8½ leagues. It lies nearly in an eastern and western direction. It is the highest range in this section of the State, and has several blades or small ranges extending in a northerly direction, between which are fertile valleys covered with grass and well supplied with water by numerous springs and ponds. Especially notable are the table-lands near the Centinela, known as the Garden (Jardin), for their exuberant vegetation. The mountains are covered with grass to their summits, where groves of pine, cedar, and oak are found. Fibrous plants—lechuguilla and zotol—are found in abundance.

Its area is about 20 sitios mayores (86,700 acres). It is well adapted to the raising of small stock.

Serranias de la Catedral.—This range is situated about 4 leagues from the preceding. Its highest peak is known as the Pico Etéreo. It is composed of a collection of high, precipitous, and rocky peaks, short irregular ranges of hills, without vegetation of any kind except near the foot of the mountains. The valleys and pasture lands formed by these ranges abound in water and grass, and in consequence of their accessibility and the protection against inclement weather afforded by the surrounding hills they are adapted to stock-raising of all kinds. Its area is about 3 sitios, or 13,000 acres.

Cerros de San Geronimo.—Situated 2 leagues from the last mentioned range. It is a long, low chain of mountains extending from northwest to southeast, covered with grass and zotol to their summits. It contains fine grazing lands, but lacks the amount of water necessary for a large number of stock, as it has no permanent streams and but few water holes of small capacity. Artificial supplies could, however, be easily provided with but little cost. Its area is about 16,350 acres.

Serranias del Nevado.—In some of the Government maps this range is called Serranias del Burro, though in this State the preference is given to the former, it being the name of its highest peak, which is situated in the center of the range. It extends in a northwesterly direction to the Rio Grande. It is composed of irregular chains of mountains, and varies in width from 5 to 10 leagues. Its various branches have also distinct names, of which mention will be made in detail: Las Flores are high cordilleras, noted for their rounded summits. They are traversed by deep gullies, which, uniting, form large streams and water holes in the valleys below. These mountains are covered with dense forests of pines, piñones and cedar, which are also seen extensively in the valleys. The valleys abound in grass and are dotted over with springs of water. The three most valuable peaks of this subrange are the Cerro de los Arboles, Cerro de Huashua, and the Cerros de los Labores. This latter is so called on account of the Indians in early times having dammed up the water in this vicinity and used it for irrigating the small farms which they cultivated.

Water is found high up in the mountains in great abundance, and here grow in vast quantities the famous maguey plant. Its area is about 7 sitios mayores (30,345 acres). Las Cierras del Cibolo extend irregularly from the Puerto de Riesgo to the Rio Grande. Forest trees, fibrous plants, and grass are abundant throughout this range, and stock of all kinds find abundance of grazing and water. The springs are comparatively few, but the water is found in tinajas (water holes), of which the most notable are the Agua Nueva, Monos, La Palma, and the famous Tinaja Bonita, anciently called by the Indians La Tinaja Colorado on account of the red sandstone which forms its sides and bottom. Long, deep valleys divide and traverse these ranges, one of which, called the Puerto del Cibolo, passing through a rift in the mountains of the same name, forms a natural road from the most southern extent as far north as the Rio Grande, and forming a junction with another from the village of Muzquiz to Bavia and Piedra Blanca (White Rock), at the last named village. Its area is 73 sitios, or 316,450 acres. The total area of the Serranias del Nevado range is about 80 sitios, or 346,800 acres.

Sierra del Consuelo.—This range lies north of the Sierranias del Cibolo (Buffalo Range). It is a narrow, low chain of mountains covered with grass, fibrous plants, and easily accessible to herds.

The valleys, whose streams run easterly to the Rio Grande, are abundant in pasture lands and conveniently accessible water holes. In this section zotol is notably abundant and of large growth. Its area is 5 sitios, or 20,675 acres.

Sierra del Bravo.—This range lies west of the Cibolo chain, from which it is separated by a narrow gateway and extends westwardly. The valleys or gullies formed by this range are wide and deep, with high perpendicular walls or palisades running nearly parallel with the

Rio Grande, forming the rockiest portion of the State. It abounds, however, in water, grass, and zotol (the latter a species of palm much used for brooms and floor matting), and has an area of about 17,340 acres.

There are isolated chains of mountains in this region, the principal ones known as the Cerro del Burro, Cerro del Colorado, and the Loma del Mosquito. They are in general well supplied with pasture and water and covered with groves of oak, pine, and cedar.

HIGH PLAINS OR TABLE-LANDS.

From that broken and mountainous tract of country extending from the highest peak of the Burro range to the river, including the before-mentioned ranges, known as Flores and Cibolo, is an extension of some 151,725 acres of high plains or table-lands. It is cut up by deep ravines which, commencing in narrow gullies, widen out into fertile valleys.

This extension of plains is covered with grass and spotted with abundant water holes. The second portion of this division is located between Bravo, Rio Grande, and the Cibolo ranges, and comprises an area of about 86,700 acres. It is much broken by deep precipitous gullies, abundant in immense quantities of grass and plenty of water in all parts. The entire area of these plains being about 55 sitios, or 238,425 acres.

HILLS.

Included under this are three grand portions of hilly country—the first in the neighborhood of the Mojonera del Caracol, extending in the direction of the river and Loma del Mosquito, has an area of about 43,350 acres, in which the water is scarce, but might be rendered abundant by means of artificial water holes. It is covered with grass, zotol, and lechuguilla, and well adapted to the raising of small stock. The second extends along the Rio Grande a distance of some 30 miles, and from 3 to 6 miles in width. It has about the same character as the former, with the exception that the water is abundant, being contained in large and accessible water holes. Its area is about 65,025 acres.

The third part of this class of country is located between the Pico Etéreo and the Boquillas ranges.

They are low hills whose vegetation is the same as the preceding, and sufficient water supplies in creeks, water holes, and the Rio Grande, which in this section is everywhere accessible. Its area is about 65,000 acres.

PRAIRIES.

This heading comprehends all the territories not comprised under the preceding divisions. It is covered in all parts with grass and zotol, and in some by lechuguilla, maguey, and nopal. It is for the most part destitute of permanent water, though traversed by a multitude of

creeks or shallow river beds originating in the mountain ranges, from which in the rainy seasons permanent deposits of water might be secured at small expense by artificial preparations in addition to permanent supplies by means of wells.

These lands can not be considered fully adequate except as pasture lands or stock ranges, in which capacity they are unsurpassed along the northern frontier.

All kinds of grass are found throughout its entire area except on the summits of a few mountains. All its mountains are easily accessible and adapted to grazing purposes. Water at whatever point may be obtained by the means heretofore indicated. The zotol and lechuguilla are of the largest species, the former producing a head of from 1 to 2 feet in diameter, and the latter a fiber long and fine.

Considering these lands in this agricultural aspect, the only irrigable parts are those near the river, which are not extensive, so that they could not be exclusively dedicated to agriculture with profit.

Any of the low land would serve for short crops, and in rainy years produce abundant crops of all kinds, the land being a rich sandy loam. The groves comprise pine, piñon, cedar, and oak, of which the best are found in the Flores and Carmen ranges.

The formation of the mountains is primary and secondary, the rock being composed of granite, syenite, lime and sand stone.

Indications of gold, silver, and copper are found in the Carmen range and near the Nevada peak; iron is found in nearly all the ranges. That portion of the extensive valley of the Sabinas River, in which are located the farms called the Nacimiento, San Juan, Soledad, and the village of Santa Rosa, with its numerous surrounding farms, about a league distant, and covering a breadth of some 3 leagues at the foot of a mountain range of some 3,500 feet high, extending northwest to southeast, is covered with dense forests of oak, pine, and tazcate, and on the west with the rocky ranges of Antonio Lopez de Santa Ana, which at the point of the Cojos joins that of Santa Rosa. On the north we have first the place called Sierrita, which in part borders on the great plain of the Nacimiento, and touching the river at the Rincon, forms the dividing line of the Nacimiento country, running first northwest, thence making a turn and joining the Sierra de las Borregos, which range runs parallel with the gateway of the Antonio Lopez de Santa Ana range, extending to the cañon of the Cabezones Creek, a peak, seen at a great distance, forming its highest altitude.

On the eastern side of the Sierrita lie the two valleys of the Sabinas and the Alamo, separated by some low hills, and their great lowlands extending to the foot of the Lomas de Olguin, more than 6 leagues from the Sabinas River.

On the east of the point of Olguin commence the lowlands of the Alamo, which here reach their widest part, extending to the foot of the Sierra de San Diego. Toward the south rise the table-lands of the Sole-

dad, Cacanapo, and Jabali, approaching and retreating from the river by turns, and forming in their meanderings some very rich bottom lands.

The Sabinas River rises among the branches which separate from the Sierra de Santa Ana (originating in a sort of dry gully that extends to the Sierras de Santa Rosa), entering at once into the great valley that here, almost at its commencement, has a breadth of nearly 8 leagues of plain, uninterrupted except by a few hills that cross it. These lowlands are composed principally of vegetable clay loam, which possesses all the requisites for a rich vegetation and adaptability for agricultual purposes.

Without much expense hydraulic works could be made to conduct the river water for irrigating purposes.

The tributaries that enter the Sabinas River from the north are Santa Ana, which, proceeding from the basin of Mapimi, in the Serranias del Carmen, brings at times great quantities of water; the springs of Chilepepin and Anderson and the permanent waters of the Moras Creek; on the south the creeks called, respectively, Ojo Azul, Cañon, and Palma, which latter forms the southern limit of the Nacimiento country. The river forms from Buena Vista to Rincon the division between the farms of the Nacimiento and those in the district of Santa Rosa, crosses these latter as far as the Pass of Oca, and thence divides the farms of San Juan and Soledad. The Sierra de Santa Rosa furnishes a great quantity of water. The numerous and abundant springs that originate in this range are sufficiently elevated to be easily utilized for irrigating purposes, and their force is of great importance for industrial works. The Santa Rosa spring, which rises half a league southwest of the village of Santa Rosa, forms at its rise a stream of water sufficient to irrigate the orchards and a large extent of farming country in its course. The Realitos, San Juan, and Garzas springs form at their very commencement streams of sufficient quantity and force to operate all classes of machinery. All the low land on the south side of the river will average in its width about 3½ leagues, and is composed wholly of alluvial deposits, partly from the river and partly from the mountain freshets, which in time of rains are abundant. The soil is black clay loam, varied in places by a mixture of sandy loam, so that it offers all that is required for agriculture.

Notwithstanding these very important natural elements, the valley is but little cultivated and is sparsely populated, which in part may be attributed to Indian invasions, which in times past were repeated with frequency and on a grand scale. There is no doubt that with an adequate immigration this section would soon be one of the most flourishing in the country. Mining, another important branch of industry, would thus also be given a corresponding impulse in this section, as may be seen from an especial study of the metallic formation of Santa Rosa.

The Sierra de Santa Rosa has occupied for centuries the attention of

miners. It is in general composed of blue mountain lime, whose caps, in the center of the Sierra, nearly horizontal, incline slightly to the southwest; while approaching the foot of the range it becomes more and more perpendicular until it assumes a vertical position.

Here in the plain it follows the carboniferous formation, rising equally at its sides and composed at its point of contact of a calcareous clayish slate, sandy carbonate, and two layers of stone coal, very close one to the other, of which one rises to the surface with a thickness of about 4 feet. The coal is of the first quality and produces good coke. Then follow slate and sandstone; and in this manner continues the carbonic formation, with few interruptions, from the Nacimiento to the Rio Grande. On the Sabinas, some 8 leagues below Santa Rosa, and also at Piedras Negras, in the neighborhood of the fort of Rio Grande, at Laredo and various other places, layers of coal run to the surface of the earth. The southern boundaries of the great coal basin appear to be the Sierras of Agua Nueva, Parras, Patos, Alamo, Encinas, Hermanos, and the Mota, as well as the valleys of Saltillo, Patos, and Parras, form parts of the coal field. The coal found in Parras is very bituminous, and probably belongs to a more modern formation.

This formation extends in a northern direction towards the basin of Mapimi, and between San José and Noche Buena, and San Antonio del Alamo and the Animas are found slate and sand carbonates. Near Presidio del Norte exists a bed of coal 1½ yards in thickness. I do not know how far north this immense deposit of coal extends. Perhaps it will be developed as being a continuation of the northern Texas coal beds, in which case it would occupy a place among the largest coal fields in the world. Its more detailed study will be for science, and more especially for industry, one of transcendent interest.

I have said above that the Sabinas River, from the Pass of Oca, divides the lands belonging to the farming country of Soledad from those appertaining to San Juan. The great plain surrounding Soledad is bounded on the south by the high table-land of the same name, which, beyond Agujita de Arriba, extends to the river. And as it is a well-known fact that the pulverization of volcanic rocks produces the most fertile soil, we may presume that the portion of the valley south of the river is by far richer than the northern portion.

Below the Agujita de Arriba the valley opens out gradually to a mile in width; thence it narrows again until it reaches the Mesquite, where the eastern point of the Soledad table-land touches the river in a pointed, rocky ledge, extending a longitudinal distance of 3 leagues. The said plain communicates at the Boquillas with the valley of the Mesquite, which is bounded on the north by the Soledad table-land, and on the south by that of Cacanapo, and has a width of 2 leagues, and extends to the foot of the Piloncillos, the ranch of the Mesquite forming its western limit. The latter is situated on a lime hill in which the petrefactions characterize the period of stone coal.

Below the jointure of the Mesquite Valley begins the table-land of Cacanapo, which forms the southern limit as far as the Cañada Honda, and in some places approaching the river so closely that it divides the valley into two parts of half a league in width. The pass of the Cañada Honda Creek is between the table-lands of the Cacanapo and Jabali. Below its mouth the valley narrows suddenly, the river approaching little by little it touches the table-land at the point of the Angostura. Here commence the farming lands of the Alamo. A straight line from the Angostura to the Jabali, and thence to the Mesilla de Berroteran divides the countries of the Alamo and Encinas from that of the Soledad. The portion of this farm which is located on the western bank of the river comprises the greater part of the table-land of the Jabali, and those of Cacanapo and Soledad, and is watered by the permanent streams of Mesquite, Bonito, Sauz, Rosita, and Berroteran, all of which rise in the Sierra de Santa Rosa. All its bed belongs to the stone-coal formation in which exists basalt, followed by conglomerate and carbonate of sandstone.

On the north side of the river lie the farming lands of San Juan, commencing at the Pass of Oca, extending west as far as the Piedras road, taking in all the lower part of the Alamo River. The valley of this river is separated from that of Sabinas, first, by a low range of hills, which soon ends, and both rivers course along the same wide plain to their place of union. This great plain has been but little cultivated, although nearly all of it, from its situation between two important rivers, is specially adapted to agricultural purposes. The Alamo River originates in the basin of Mapimi, formed by the Cerranias del Carmen, passes along the Bahia and receives many tributaries from the west. In the rainy season it carries a large amount of water, but during very dry weather its bed becomes dry, and it contains water only at intervals in its large water holes. At a distance from its union with the Sabinas the valley is confined by the hills of the Pinal, Chata, Aire, Alejandro, and Retama, inclosing a site of half a league in width, affording commodious advantages for colonization. A straight line from the mouth of Blanco Creek to the Punta de Olguin separates it from the Alamo country.

Below the ranch of San Felipe there is another beautiful plain whose mesquites extend toward the east to the large creek of the river, and thence comes down another forest of mesquite, both following its course until reaching the Sabinas River after running along a table-land which only at considerable cost could be reduced to profitable cultivation. The circumstances are more favorable on the opposite or southern side of the river. Commencing at the Angostura, where the Jabali table-land touches the river, it extends about a mile south, and runs parallel to the river as far as the Water-hole Creek, embracing a plain of exceptional richness of soil. Another plain stretches on from the mouth of the last-named creek, which continues until the union of the two

rivers, occupying a superficial area of 6½ leagues in length by 1 in breadth; and as the river has various points at which the water may be easily diverted for irrigation, this tract of land is under all aspects well adapted to colonization on a large scale. It is not to be supposed that agriculture would here produce any good results without irrigation, for the reason that all this section lies in the region of an unvaried temperature; in other respects this region has a climate very favorable to the raising of wheat, corn, and cane, and its cultivators having all along dedicated themselves to the raising of cotton is good proof of its adaptability to this profitable branch of industry as well as to the raising of tobacco, and principally to the production of mescal, which at the foot of these basaltic hills finds a climate par excellence. Even rice would thrive abundantly in the valleys. In no part as along the Sabinas is shown the beneficial climatic effects of the proximity of mountains covered with forests. At the foot of the Santa Rosa range vegetation develops rapidly without artificial irrigating; and the farms of the Nacimiento and Santa Rosa frequently receive copious showers of rain, while the Soledad and San Juan, as well as all the lower country are bathed in bright unshine.

There the vegetation is of extraordinary growth and trees of high altitude are found. Beautiful cypress, walnut, and chestnut trees embellish both sides of the river, and the plains are covered with forests of mesquite. The hills are green with all classes of verdure, offering excellent pasture for cattle, horses, and sheep. Below San Juan and Soledad the forest groves diminish, particularly as they recede from the river, and their place is occupied by underbrush only, although the grass is abundant and stock thrives well. The lower part of the Salinas Valley, from the union of both rivers to the Burro Pass and the mouth of the Aura River, is bounded on the north by the Guates Mountains and a few ranges that separate this valley from the Sabinas Valley and the table-land of the Jabali; on the west it is bounded by the table-land of the Chapote range, and a few adjoining hills with the Santa Cruz range and the table-land of the Quebrada; on the southwest by the Burras range, from the pass of the Baluarte and that of Candela; and on the south by the Cartujanos table-land, the great plain of Lampazos, and the Mesillas.

The greater part of the valley that occupies the northern side of the river is traversed by the Animas sandhills, which belong to the carbonic formation, and which, owing to the eccentric elevation from volcanic forces, have on the south side a steep descent, while on the north the descent is gradual, losing itself almost imperceptibly in the plain. This land is watered by the Delgado Creek, which, above the Alamo, joins the river. This large plain of more than 130,000 acres would all be tillable land if the water supply was sufficient, but at present only a small portion could be profitably cultivated. The general disposition of the ground renders it favorable to the employment of artesian wells,

and with this auxiliary all the Delgado Cañon would be adapted to agriculture. The dense ranges of mountains on the west, as far as the Sierra Madre, which form the dividing ridge between the two oceans, are for the most part of eruptive or volcanic origin; elevated as they were by the powerful forces of subterraneous watery vapors, caused by the formation of caves that have later become filled by the infiltration of rain water. The gradual ascent from the valley of the Sabinas to the center or high ridge of the Sierra disposes a corresponding elevation of the valleys between the successive mountain ranges, like the steps of a staircase, so that these deposits of water must be much higher than those of the Sabinas, and easily accessible, as they exist near the surface. The southern part of the valley or plain belongs to the Alamo, and the northern to the Encina farming lands, the dividing line being indistinctly drawn, nor is it possible to state exactly how far west the lands of the latter extend. It appears, however, that its limits extend to the Santa Rosa and the northern part of the Obayos as far as the Puerta, in which case it comprehends all that part below the Aura River. This river has its origin in the Mapimi Basin, and though its higher course is almost unknown, in consideration of the vast amount of water it carries, it is to be inferred that its tributary basin must be extensive. Its course divides the isolated ranges of the Santa Rosa and Obayos, and its little valley at its entrance to the large one of the Soledad reaches on the north the Berroteran hills, and on the south the Gachupines, both sets of hills being of carbonic sandstone, in which abound animal and vegetable fossils. Farther on the valley suddenly narrows and forms only a deep creek on the east until it reaches the foot of the Quebrada table-land, 2 leagues distant; on the west, winds about various serpentine ranges of hills of slight elevation. Its crystal waters course along at first in a bed of solid lime rock and sandstone; but below the Gachupines it enters a limy permeable canal, and its waters are gradually lost until the lower part of the bed becomes entirely dry.

The Alamo lands and the Villa del Progreso have but little of their territory under cultivation and the greater part of the water is therefore not utilized. The southern part of the valley is not inferior to the northern in quality, but only a part of the land belongs to the Encinas and Alamo, the division being a right line from the Puerta de Guerra to Boca del Jabali.

The Encinas farm is situated at a distance of a quarter of a league south of the river beside a large spring, which, with another that descends from the mountains, is used to irrigate its fields. The Hermanas ranch comprehends both banks of the Sabinas River between the Burro and Burras passes. Its buildings, both dwellings and storehouse, are situated on two hills of conic French form, called Las Hermanas (the sisters), from which the ranch has taken its name. Half a league south is a hot spring at a point in the Obayos range. These

thermal waters are in an elevated position, and on their appearance at the surface have a temperature of 33° R.; that is, blood heat, and hold in solution a variety of mineral substances such as common salt, lime, etc., and though disagreeable to the taste are of great value for fertilizing purposes. All the fields in cultivation are on the west side of the river, and comprise about 4,350 acres, but another square league of the land could easily be watered from the same source. Sugar cane, wheat, and corn are harvested in excellent condition, and there is no doubt that cotton and tobacco could be raised with good profits.

The Oballas range, whose "divorcium aquarum" form part of the western limit, contains nearly in its center the famous pasture lands. Its plain, surrounded on all sides by high perpendicular walls, is 2½ leagues in length by 1 in width, and is covered with succulent grasses. This valley has two narrow entrances; that on the east known as the Puerto de Oballas and the one on the west as Borregas. The eastern entrance, from its rocky nature, is only serviceable as a bridle path, while the western has a good wagon road. In the midst of the pasture runs a creek of brackish nature good only for stock and fertilization, but at the eastern entrance is a spring of sweet water that supplies the ranch.

The mouth of an old silver mine, abandoned probably for the water, serves as a habitation for a part of the population. The fields lie at the foot of the mountain in soil of the first quality, and only cultivators are wanting to plant them. The rest of the plain is fertile and level. The unpopulated portion, known as Tapado, situated in the western margin of the Monclova River, which at a short distance joins the Sabinas, deserves particular mention for the richness of its soil and adaptability for colonization.

A right line from the Chorrera de la Rata, on the western side of the high mountain, to the north point of the Potrero de los Flores divides the Hermanas from the Mota ranch. The latter takes in the greater part of the valley, which on the west reaches to the Gloria ranch and on the east to that of Candela, being traversed at several places by hills that belong to the geological formation of the stone-coal period, the same as the sandstone ranges of the Hormigas, which rise gradually to a height of thousands of feet, the most curious of them being the Rata, whose immense ledges rise separately and evenly to a height of some 4,000 feet, with a length of about 3¼ leagues by 1½ in width. South of this, at the foot of a small mountain, in the bed of a dry creek, is the crater of an active volcano, whence escape constantly sulphuric vapors. Its diameter is 5 yards and its depth has never been sounded, a stone dropped into it being twelve seconds in reaching the water that lies at the bottom. The Panuco, Guadalupe, Sierra Colorado, and other ranges have dislocated and elevated the coal formation and discovered metallic veins. For instance, in the Panuco range is found a copper vein mixed with silver and gold, which at the surface is several yards in thickness.

These lands, in consequence of the scarcity of water, are better adapted to stock-raising than for agricultural purposes.

The wild maguey constitutes the principal richness of the valley, and the inhabitants of the Mota, Tayunas, San Gabriel, Enramadas, and adjoining ranches occupy themselves chiefly in the production of brandy and mescal, and these plants, spontaneously and without any cultivation whatever, produce such abundant crops that the wine factories in existence can not harvest the offerings of nature.

The extraction of the juice and the distillation of alcohol are practiced by ancient and imperfect methods, therein causing a great waste that might be avoided by the employment of modern distilling apparatus; and by cultivating the maguey plant numerous wine farms could be profitably established that would occupy a high place among those of the country.

The foregoing demonstrates in a fairly clear and evident manner that the valleys and lands described are admirably adapted to purposes of colonization, while they are easily accessible by good and safe roads, and three important railroads already traverse the State, the Mexican International, Mexican National, and the Mexican Central.

NOTABLE RIVERS IN THE STATE.

The Rio Bravo or Rio Grande bathes the northern part of the State. It rises in the State of Nevada, U. S. A., receiving as tributaries the Conchos, Puerco, San Pedro, San Diego, Escondido, San Roderigo, San Antonio, and Sabinas, and passes along the northern borders of the States of Chihuahua, Cohahuila, and Tamaulipas, emptying its waters into the Gulf of Mexico.

The Nazas commences on the eastern side of the Sierra Madre Mountains, west of the Partido del Oro, in the State of Durango, entering the State of Cohahuila at its southwest corner. Its waters fertilize the land all the way from the starting point through the country of Santiago, Pasaquiaro, Nazas, and Mapimi, till they reach and form the beautiful and famous Laguna de Parras, whose margins are constantly covered with water fowl. This river at an earlier date took a more northerly course after entering the State, forming at its termination the Laguna of Tlahualila, but in 1839 it changed its course to its present bed.

The Aguanabal River is in the Tresnillo range, in the State of Zacatecas, and runs in a northerly direction, passing Rio Grande, Nieves, and San Juan de Guadalupe, until it reaches Viesca, where it forms the Alamo Lake.

There are other rivers, though not of the importance of those mentioned, among which are the Sabinas and Nadadores, before mentioned, whose affluents are the Alamos and Salado. The Nadadores rises at the village of Sacramento.

CLIMATES OF THE STATE.

More than the strange configuration of the soil of the State and its distance from the north pole towards the equator, its elevation above the sea level is that which really determines the variety of its climate, making localities of equal latitude, and separated only by short distances from each other, of entirely distinct climates.

All the territory of the State is comprised without the temperate zone. The climates of the State may be classified under three general divisions: cold, temperate, and hot.

The first in the order of classification are those in an altitude of 2,000 meters and upwards above the sea level, the second are those of an altitude of 1,000 to 2,000 meters, and the third, those localities of less than 1,000 meters above the level of the sea.

THE MINERAL REGION OF THE STATE.

From the period of the Spanish Conquest began the development of the branch of mining, though with equal risks and difficulties, from the frequent incursions of the savages, who caused the mines that had been discovered and were being worked to become unpeopled and abandoned, producing necessarily thereby the ruin and decadence of an important source of wealth, upon which Cohahuila has always largely depended.

Already in 1674, when the conquistor D. Antonio Balcáral effected his entrance into this province, we are told that vestiges of mineral workings were found, as stated in his report as follows:

> On the glorious St. Clement's anniversary, I, first alcalde, having come within 3 leagues of St. Cecilia de Castaño in a plain of some 2 leagues in circumference, which I found deserted and unpopulated, covered with a dense underbrush, and some old walls of fallen houses, in one of which were a lot of broken rocks and two furnaces for smelting silver, and other apparatus, with signs of water conduits, etc., extending to a river running from south to north.

Another of the most ancient mines of the State is that of Potrerillos in the Monclova district.

Santa Rosa mines.—According to the archives existing in the village of Muzquiz, it is apparent that in very early times there was a period of great animation and activity in mining matters in that region. There are 22 abandoned mines that were discovered in the past century, whose names were as follows: La mina del Rosario, whose metals produced 12 ounces to the cargo, and was anciently considered the richest mine in that range. La mina Vieja, which gave 6 ounces per cargo, La Cruz from 4 to 9, San Alejo 6, Sacramento 1 mark or 8 ounces, Jesus Maria 1 mark, El Carmen 7 ounces, Guadalupe, San Miguel, Concepcion, San Alenogenes, San Nicholas, El Refugio, Moncaras, San José, Nogalitos, Las Higueras, and San Bernardo, producing from 3 to 20 ounces. During the present century have been discovered the mines of El Pabellon, Santa Gertrudis, San Juan, and the one called Bajo.

According to the latest reports made to the State Department relating to the mining region just mentioned, there are already 32 mines denounced and opening, and two sites for smelting works. Of those recently denounced in the Alamo Cañon the principal ones are: El Cuarzo Grande, of Messrs. Ord & Treviño, and El Caballo Azul, by Messrs. Wilkinson, Owen & Swilling.

In the Nogal Cañon the shaft has been sunk at the Gwendolen mine, denounced by Smith & Co., La Fronteriza, in which latter mine a deep shaft has been sunk and a tunnel excavated, through which rich ores are being extracted that have already attracted the attention of Americans through the scientific assays made of the metals. Mr. Proctor is also excavating a tunnel, and Messrs. Davis & Co. possess a mine located between that of Mr. Proctor and the Oso Grande. In the veins of Oso Grande and the Rubi a shaft and tunnel are in operation.

Mr. Richard E. Chism, the mining engineer, has reported on this mineral district as follows:

Formation.—The formation of this district belongs to the Silurian period; it is of slate and limestone, and is constituted by beds that I believe have some 800 to 1,000 meters of thickness. The lime rock probably overlies granite, etc., of the primitive geological formation and is surrounded by Plutonic rocks of those called brachytic and porphyritic.

Veins.—The beds of limestone form something like an irregular island in the midst of Plutonic rocks; outside of this island, which is about 10,000 meters long by 3,000 wide, ore has not been found. The lime rock, on the contrary, is traversed by more than 20 veins that all present indications of silver, while some have it in large quantities. Besides the silver veins there are other veins or dikes of volcanic rock that do not contain silver. The silver veins have a general direction between south and west, inclining more to the west, while the dikes take a more southerly direction, or between south and east, so that the two systems of veins cross each other at various points. The veins of this region, metallic as well as the others, are true fissures, well formed, and with every indication of traversing the entire limestone bed, although it is possible that they do not extend through the lower formations. The interior structure of the veins presents bands or zones of silver ore alternating with white or colored streaks of quartz, white spar, and calcite. At the contact of the limestone and the volcanic rocks we have layers of iron, silver ore combined with red quartz, and the other minerals above mentioned, but they do not present the same regularity of structure as the other veins. The minerals are chloride and bromide of silver with a mixture of sulphide of the same metal in certain places. Of lead there has been discovered some carbonate and a little galena. As the ores named are all products of the decomposition of sulphides, there ought to be encountered in the depths of the veins a class of ores very different from those at the surface, and it may be possible that the greater part of the mines contain an abundance of lead metals in depth.

From the vegetation and other indications, I suppose that the bottom of the valleys of this district is 2,000 meters above the sea level, while the summits of the mountain range must be 3,500 meters above the level of the sea.

It is said that the mean temperature of this mineral district is 61° F., with an agreeable and unvaried climate.

The following assays made of the metal of the district to which we refer give an exact idea of its wealth:

	Silver.	Gold.	Lead.	Copper.
	Oz. per ton.	*Per cent.*	*Per cent.*	*Per cent.*
1. Pinchbeck	16	Trace...	.0	.0
2. Copper	1,892	0.60	.0	6.00
3. Copper, red oxide	383	0.10	.14	10.50
4. Carbonates, blue and black	1,455	0.10	.0	.07
5. Sulphides, black, blue, and dark	919	0.30	.78	.10
6. Carbonates, green and yellow	756	1.10	.25	9.40
7. Pearl-gray ore	1,112	1.70	15.80	.01
8. Black iron ore	117	Trace...	5.80	.0

The preceding assay has been made by the St. Louis Founding and Mining Company, and the following by a San Francisco, Cal., assayer:

Number.	Gold.	Value.	Silver.	Value.	Total value.
	Per cent.				
1	Trace...	.....	130 4.10	$168.62	$168.62
2	...do ...	.....	26 2.10	33.84	33.87
3	1.10	$2.07	1,119 9.10	1,551.36	1,553.43
4	Trace..	.....	42 5.10	59.56	59.47
5	1.10	2.07	3,096 3.10	4,003.30	4,005.37

Sierra de Ramirez.—This mining district has also had flourishing epochs, in which great quantities of ores have been extracted. The principal mines are La Esmeralda, La Calavera, La Providencia, San Acacio, and one anciently called San Juan de Valenciano. Some of these mines were objects of noisy and prolonged litigation and questions of dispute with the adjoining State of Durango.

Sierra Mojada.—This is the most modern mining region of the State, and for many years was unknown and ignored. By its present name this range has been known from a remote period. It is stated that in 1646 a captain of militia at Parras made an expedition against the savages, penetrating as far as the present mining region, where 12 of his soldiers were killed in a skirmish with the enemy, and that from that time it has been known as the Sierra Mojada (wet mountain). In this rich range of minerals there are 32 mines in existence, known as the Esmeralda, San Salvador, La Parreña, San José, Jesus Maria, El Pabellon, Santa Elena, San Miguel, Dolores, La Victoria, La California, La Favorita, La Montaña de Dick, La Sultana, El Regalo, San Lorenzo, San Rafael, La Florida, La Huerfana, La Indita Mexicana, La Aurora, El Carmen, La Filipinas, Guillermo y David, San Dimas, La Huajuqueña, El Cinco de Mayo, San Agustin, San Pedro, San Luis, La Veta Rica, and El Siglo XIX. The ores discovered have a leadish, ironish, and copperish color; they produce from 2 to 8 ounces to the cargo (300 pounds). The products from the year 1880 up to the month of April, 1882, were 29,329 marks, 234,632 ounces of silver, besides having extracted during the same time for the general Government 25,567 marks. The value of the silver extraction is estimated at more than a million dollars, but

owing to the imperfect smelting it results with a loss of more than 3 per cent. The following is a scientific report of these metals:

The Sierra Mojada mining region is situated at about 60 leagues northwest of the town of Cuatro Cienegas, and according to barometric observations its level above the sea is about the same as that of Saltillo. The formation of the bed of the cañon or valley is a conglomerate of plutonic rocks, as granite and porphyry, belonging to the Permian period, which is well developed in the cañon of the Tres Rios, and distinguished by its reddish color. It is followed by a stratum of compact limestone, pertaining to the formation of magnesian limestone. Above this are deposited stratum of the Jurassic period, as demonstrated by the different petrifications or fossils encountered in them.

The Sierra Mojada range is from 6 to 7 leagues in length, from east to west, and at the place of the mines reaches an altitude of 300 meters (or about 1,000 feet), rising almost perpendicularly. At the foot of the Sierra, on the north side, exists a vein of ore half a league in length by 20 to 30 meters in width at the surface. The inclination of this vein is about 30° south. On the western side of the vein are found great masses of red oxides of iron, with copperish metals, and in places green silver (chloride of silver). On the eastern side the character of the vein is more of limestone with iron, ocher, and magnesia, and lead ores predominate, particularly the carbonate of lead with silver ore, veraging from 5 to 12 ounces per cargo of 300 pounds and 20 to 25 per cent. of lead, etc. There is no doubt that this mining section is of great importance, and in time new discoveries will be made as the country becomes settled.

The mineral localities herein described are the principal ones of the State, although there are besides mines of excellent ores at Candela, Arteaga, Ramos, Arispe, and others.

THE COAL REGION OF COHAHUILA.

A brilliant perspective awaits this State in its rich and extensive beds of stone coal, whose incipient development has already produced bountiful results. At the west of the village of San Juan de Sabinas, in the region of San Felipe, exists an extensive coal mine which the owners have been working for some time past and disposing of the coal to the Mexican International Railroad, for whose supply it is nearly sufficient. Another coal mine is being worked in Santa Rosa range, in the district of Monclova, and its products are sufficient for the smelting works of Cearal mines. Other coal mines are being worked near the towns of Juarez and Guerrero.

Mr. Henderson has assayed the coal of the San Felipe mine with the following results: 62.32 per cent of permanent combustible, 19.22 per cent of volatile, 18.88 per cent of ashes, and 0.54 per cent of water. The scientific observations of Mr. Koehler give an exact idea of the richness of this coal region and are herewith appended. Much has been said of the precious metals that abound in the mountains of Santa Rosa, Candela, Panuco, etc.; but the most important and valuable mineral in

the future wealth of this country, the stone coal, has been passed over in silence. At less than half a mile from the well-known silver mine of Cearal, situated 2½ leagues southeast from Santa Rosa, appears two coal beds, one of which measures over 4 feet in thickness. The formation of this locality, composed of slate clay, alternating with stratum of of sandstone, is in the mountains of blue limestone. The depression at the foot of the mountains is perpendicular, separating itself more and more towards the valley of the Sabinas River. I shall try to give an idea of the extent of the coal formation in the northeast of Mexico. The point farthest north, where coal exists to my knowledge, is Presidio del Norte, on the Rio Grande, where the formation accompanied, according to the report of the mining engineer, Mr. Schuchardt, is identical with that observed at Santa Rosa. The vein shown him for inspection measured 1½ yards in thickness.

Another locality of vast extent is the great desert or plains of the Bolson de Mapimi, between San José de Piedras and Noche Buena, and although Mr. Schuchardt, in his rapid trip through this country, made no discovery of coal, he inclines to the belief of its existence there. Observing the continuance of these plains and of the ranges of mountains, the extension of the formation of coal towards the Rio Grande is apparent. When I passed through this section of the country, nearly all the mountains consisted of metamorphic rocks, porphyric and serpentine, with their numerous transitions of one into the other. The metamorphic action may be observed in the coal formation. In some localities the beds of slatestone and sandstone are found in their natural state, but farther on they commence to change and present porphyry of very different colors and composition, the beds preserving their original course and depth (about 15° southwest). Small veins of spar limestone, of an opaque appearance in the adjoining beds, unaltered by slate clay, have been transferred into beautiful transparent Iceland spar, with double refraction. Towards the southeast, 1 or 2 miles on the road from San Antonio de los Alamos to Santa Catarina, again cross for many miles hills of slate coal not in the least changed. The chain of mountains in the neighborhood present very little alteration from there to the Puerto de Obayos, no metamorphisms being noticeable, here and there being small hills and table-lands of eruptive rocks, as basalt, amygdaloid, etc.

Farther on to the southeast, near Monclova and the Mota, the slate and sandstone appear again, and it is said that in the table-lands of the Hormigas the coal shows its existence; also at the south of the cañon, where Saltillo is situated. A slate similar to that of Santa Rosa rests on the base of blue limestone near Parras. Here the limestone is more bituminous and manifests the vegetable texture. It is still to be determined if this carbon has any connection with that of the east, or if it is of a more recent origin and belongs to some other period. Less interrupted by the upheavals of the mountains, the formation of carbon

extends from the Nacimiento, at the origin of the Sabinas River, to Piedras Negras, on the Rio Grande, following this river to Laredo and to the mouth of the Sabinas River. It is bounded on the south by the Patos mountain range. In many parts appear these carbon crests, and the samples that I had an opportunity to examine are of very good quality and produce excellent coke. The extent of this formation north of Piedras Negras is not known to me, but its connection with the great coal bed of Texas is very probable, and the connecting link may be discovered later. A more careful and extensive examination would lead undoubtedly to the discovery of many new localities of coal deposits at present unknown or concealed under deposits of alluvium. Before this nobody had made use of coal, although a feeble effort was made to smelt lead ores with a percentage of silver. Not knowing how to convert the coal into coke, furnaces became clogged with uncalcinated coal and good results were not obtained.

Near Monclova, in the mountain ranges of Candela, are found also in abundance silver, copper, iron, and other ores; also near Patos, which with the assistance of the neighboring carbon, may some day be utilized. Magnetic iron is also found that exhibits polarizing qualities. In some veins are found, near Castaño, indications of having been worked at an earlier period, but it is not apparent with what object. Some of the numerous and extensive copper veins have been worked to a depth of several yards, on account of the gold it was supposed that they might contain, and in the crests are displayed carbonate of copper, pyrites of copper, etc., with granite for mold, that produce from 5 to 15 per cent of copper. The granite is easily melted and forms at the same time a very good scoria.

RACES OF THE STATE.

The mixture of Spaniards and indigenes is the predominant race throughout the State; next the Tlaxcaltecas, who were transplanted here from the ancient Republic of Tlaxcala by the first Spanish conquerors of the country; they were brought with them for the pacification and settlement of this country, known at that time as the Province of Nuevo Estremadura. Of those who came with Don Francisco Urdiñola, a portion founded the town of San Esteban, now a part of Saltillo; others founded Patos, Parras, Viesca, and other towns on the frontier. There exist also in the State some remnants of the tribes of Seminoles, Lipans, Kickapoos, and Mescaleros, who are peaceable.

POLITICAL DIVISION OF THE STATE.

The State of Cohahuila is divided into five judicial districts, viz, Saltillo de Ramos Arispe, Parras de la Fuente, Viesca, Monclova de Muzquiz, and Rio Grande de Zaragoza.

SALTILLO.

This beautiful capital of the State of Cohahuila is situated on the northern descent of the pendant of the table-land known as the Ojo de Agua. Its topographical situation forms a beautiful perspective from the stretch of country on the south and the exuberant vegetation in which it is always clothed. This table-land is formed in the western branch of the Sierra Madre range, where it makes a descent on the northern side, which in some places is gradual, and in others is formed of hills and ranges, some of which reach a high elevation. At the foot of these hills reclines the city of Saltillo, with the Ojo de Agua table-land for its southern horizon, on the east the Sierra Madre, on the west the Cerro del Pueblo, while on the north the view extends more than a hundred miles, in whose perspective rise multitudes of hills surrounding delightful valleys. The name Saltillo is supposed to be a corruption of an expression in the Chickimeco language signifying "high land of many waters." And this signification gives a clear idea of the character of the location of the city. In effect the city of Saltillo, reclining peacefully above the gentle declivity on the south, appears to slumber amidst the murmur of the many rivulets formed by the springs above whose crystal waters supply the numerous fountains of the public squares and private dwellings of the city. Besides the excellent quality of the water of these springs, that called the Ojo de Agua, from which the fountains are supplied, is of a sufficient elevation to force the water entering the fount to rise to any height desired. Few populations possess the number of fountains that Saltillo enjoys, all of which are supplied by the Ojo de Agua, leaving the rivulets of the other springs for the benefit of baths, washing, and irrigation, and water-power for the mills and factories of the city.

SETTLEMENT.

The original records of the founding of Saltillo can not be found in the archives of this city; they are supposed to exist in those of Durango, as the jurisdiction extended east as far as the valley of Saltillo, and comprised also that of Parras; so there are good reasons to conjecture that these interesting documents may be found in the archives of Durango, because of the strict obligation on the part of the conquerors to render an account of any new locality settled by them. In the year 1829 the governor of the State, D. José MaViesca, endeavored with great diligence to discover the whereabouts of the original titles, consulting with this object the archives of the Marquis of Aguayo, but without success. The discovery of Saltillo is due to D. Francisco de Urdiñola, sr., who was peaceably received by the tribes inhabiting this region, and when at a later period he wished to govern them with energy, the Indians revolted, and in the contest that ensued he was severely wounded and was obliged to relinquish his conquests, and

finally died of his wounds at Mazapil. After a few years D. Francisco de Urdiñola, son of the former, confirmed his father's enterprise, according to the instructions received from him before his death.

In the year 1575, D. Francisco de Urdiñola, jr., arrived at Saltillo on the 23d of July, and held conferences with the tribes of Huachichiles and Borrados, who inhabited this territory, having their principal residence in the mountain range on the east of the present site of the city. Peace was consummated on the 25th of the same month and year, when possession was taken of the place and the name Santiago del Saltillo was given it in consequence, being the calendar day of that saint (Saint James). Urdiñola was accompanied by four hundred Tlaxcalteca families and sixty families of Spaniards, the principal of whom, after Urdiñola, being General D. Matais Aguirre, Cristobal Perez, Diego Montemayor, Diego Rodriguez, Alonzo R. Gonzalez, Pedro de Ubergo, Juan Navarro, Alberto Cantú, Santos Rojo, Mateo Perez, Martin Solis, Melchor Alvarez, Fortunato de Aguirre, Juan Perez, Jesus Hernandez, Alberto Fernandez, Francisco Martinez, Roderigo Perez, Alonzo Fernandez, and Pedro Gentil. The first cure Saltillo had was Rev. Urbaldo Cortez, who accompanied the first settlers.

Although the tribes of Huachichiles or Cuachichiles and Borrados lived in peace with their conquerors, still they did not unite with them, but remained separated until the year 1591, when a certain Enrique or Villamanrique made propositions to these aborigines, and through Caldera, a Chichimeco chief of great influence, after many conferences with the old men and chiefs of the tribes, was successful in inducing them to adopt civil life and subject themselves to conditions proposed by the Spaniards. By the preceding it will be seen that Urdiñola, jr., was the founder of Saltillo and Pueblo de San Esteban, and at the same time the first conqueror of Coahuila. As before said, D. Santos Roja was one of the Spaniards who came to Saltillo with Urdiñola. He was a merchant and a devotedly religious man. His wife was Doña Beatrice de las Ruelas, of Mexico. From his personal property he constructed the chapel that forms part of the parochial church building dedicated to the services and prayers for the dead, of which he was a devotee.

D. José Ma. Jove, who for several years was administrator of Patos, Bonanza, and Rosario, in the Parras district, had occasion to examine the archives of the Marquis of Aguayo, at the instigation of the cure of Saltillo, who desired to investigate the founding of the city. He could not, however, discover any data that indicated the whereabouts of the document of settlement, ascertaining simply that D. Francisco de Urdiñola, jr., captain of Mazapil, organized the expedition for the conquest of territories subsequently known as Coahuila, the entire cost of the expedition being paid by himself. He brought into the country the first herds of horses and cattle, and the first flocks of sheep and goats, distributing them in localities of good pasturage and water. The fol-

lowing lands about Saltillo were distributed among the Spaniards who accompanied Urdiñola, and whose several residences received the names of their first owners. The slaves that he brought were sent to Patos, and the Tlaxcalteca Indians remained, a part of them, at Saltillo, founding the Pueblo de San Esteban, and the remainder were established at Parras.

MUNICIPALITY OF SALTILLO.

Saltillo is bounded on the north by Ramos Arispe, on the east by Artega and the State of Nuevo Leon, on the south by the States of San Luis Potosi and Zacatecas, and on the west by the town of Patos. Its population is about 30,000 inhabitants. Its latitude is 25° 25′ north, and its longitude is 1° 15′ west of the meridian of Mexico, while its altitude above the sea level is 1,597 meters, or about 5,200 feet, according to barometrical estimates by Mr. Miguel S. Maynes.

JOHN WOESSNER,
Consul.

UNITED STATES CONSULATE,
Saltillo, January 25, 1888.

EXPORTS OF BRITISH COAL.

Statement showing the exports of British coal, coke, and cinders in 1889.

COAL AND CULM.

Whither exported.	Quantities.	Value.	Whither exported.	Quantities.	Value.
Foreign countries:	*Tons.*		British possessions:		
Russia	1,695,027	£3,829,542	Channel Islands	98,658	238,434
Sweden and Norway	2,215,097	4,739,484	Gibraltar	539,929	1,523,058
Denmark	1,343,104	2,763,488	Malta	604,123	1,947,430
Germany	3,420,039	6,666,420	South Africa	342,693	978,166
Holland	472,873	1,158,108	Mauritius	38,635	121,650
Belgium	276,870	583,920	Aden	233,623	690,672
France	3,926,887	8,943,708	British India:		
Portugal, Azores, and Maderia	548,358	1,459,800	Bombay and Seinde	585,066	1,239,842
Spain and Canaries	1,434,137	3,878,202	Madras	13,615	34,062
Italy	3,359,011	7,683,414	Bengal and Burmah	84,863	92,454
Austria-Hungary	77,857	183,042	Straits Settlements	246,753	778,560
Greece	177,853	481,734	Ceylon	287,977	886,148
Roumania	151,717	433,074	North America	87,296	209,238
Turkey	446,207	1,289,490	West Indies and Guiana	215,673	574,188
Egypt	1,451,875	3,994,986	All other	62,630	.....
Algeria	110,431	282,228			
Western Africa	433,213	1,352,748	Total to British possessions	3,391,511	9,716,429
Eastern Africa	52,691	170,310			
Java	59,666	175,176			
Other Dutch possessions in the Indian seas	15,841	43,794	Grand total to foreign countries and British possessions	27,504,911	67,335,708
United States:					
Atlantic	35,003	165,444			
Pacific	19,954	48,660			
West Indies	165,924	491,466	Coke and cinders to all countries	769,480	2,793,048
Peru	59,977	165,444			
Chili	145,966	360,084			
Brazil	691,719	2,209,164			
Uruguay	476,883	1,522,250	Fuel manufactured, to all countries	682,054	1,800,420
Argentine Republic	742,764	2,345,412			
All other	76,516	.....	Grand total	28,956,445	71,929,212
Total foreign countries	24,113,400	57,619,279			

EXPORTS OF AMERICAN COAL.

Statement showing the Exports of American Coal in 1889.

Countries to which exported.	Anthracite.		Bituminous.	
	Tons.	*Dollars.*	*Tons.*	*Dollars.*
Argentine Republic	100	370	200	600
Austria				
Belgium			350	1,050
Bolivia				
Brazil			215	847
Central American States: Costa Rica			34	178
Guatemala	4	24	67	832
Honduras			30	114
Nicaragua	11	59	802	3,370
San Salvador				
Chile	318	1,431	113	945
China	539	2,311		
Denmark			140	420
Danish West Indies	349	1,703	53,351	143,517
Greenland, Iceland, and Faroe Islands			150	450
Ecuador				
France	50	165	4,785	14,515
French West Indies	305	1,433	28,964	81,810
French Guiana	40	153		
Miquelon, Langley, and St. Pierre Islands	852	4,208		
French East Indies				
French Possessions in Africa and adjacent islands				
French Possessions, all other				
Germany	4	26	6,625	20,024
England	22	71	17,844	55,445
Scotland	5	26	570	1,710
Ireland			2,615	7,845
Gibraltar				
Nova Scotia, New Brunswick, and Prince Edward Island	75,845	320,788	4,635	12,082
Quebec, Ontario, Manitoba, and the Northwest Territory	826,671	3,731,724	462,602	1,286,856
British Columbia	19	229	347	5,606
Newfoundland and Labrador	1,356	6,605	750	2,753
British West Indies	1,426	5,895	2,561	8,178
British Guiana	188	800		
British Honduras				
British East Indies				
Hongkong				
British Possessions in Africa and adjacent islands	51	200		
British Possessions in Australasia	20	75		
British Possessions, all other				
Greece				
Hawaiian Islands	153	841	988	8,056
Hayti	1,437	6,218		
Italy			600	1,860
Japan	77	300	1	15
Liberia				
Mexico	2,762	12,229	24,262	153,497
Netherlands	54	600	350	1,050
Dutch West Indies	310	2,561	3,530	10,071
Dutch Guiana	32	137		
Dutch East Indies				
Peru				
Portugal	28	216		
Azore, Madeira, and Cape Verde Islands	8	40		
Portuguese Possessions in Africa and adjacent islands	20	80		
Roumania				
Russia on the Baltic and White Seas			800	2,400
Russia on the Black Sea			500	1,500
Russia, Asiatic			354	2,836
San Domingo	374	1,733	790	2,577
Spain			890	8,014
Cuba	26,066	100,504	172,622	480,590
Porto Rico	151	850	1,813	6,040
Philippine Islands				
Spanish Possessions in Africa and adjacent islands				

Statement showing the Exports af American Coal in 1889—Continued.

Countries to which exported.	Anthracite.		Bituminous.	
	Tons.	*Dollars.*	*Tons.*	*Dollars.*
Sweden and Norway				
Switzerland				
Turkey in Europe				
Turkey in Asia				
Turkey in Africa				
United States of Colombia	46	278	44,123	134,552
Uruguay			1,419	4,257
Venezuela	1,188	4,862	1,006	7,014
All other countries and ports in Asia				
All other countries and ports in Africa				
All other islands and ports	1,913	7,258		
Total	943,304	4,217,003	841,798	2,473,476

SPECIAL CONSULAR REPORTS.

GAS

IN

FOREIGN COUNTRIES.

REPORTS FROM THE CONSULS OF THE UNITED STATES IN ANSWER TO A CIRCULAR FROM THE DEPARTMENT OF STATE.

ISSUED FROM THE BUREAU OF STATISTICS, DEPARTMENT OF STATE.

ALL REQUESTS FOR THESE REPORTS SHOULD BE ADDRESSED TO THE SECRETARY OF STATE.

WASHINGTON:
GOVERNMENT PRINTING OFFICE.
1891.

GAS IN FOREIGN COUNTRIES.

CONTINENT OF AFRICA.

CAPE TOWN.

REPORT BY CONSUL HOLLIS.

There are only three coal gas manufactories in Cape Colony, and I have been unable to obtain any information except from one in Cape Town, which is herewith given.

Name of company, South African Company (Limited); amount of money invested, £100,000; price of gas per 1,000 cubic feet, 8 shillings ($1.94). To questions 3, 4, 5, 6, 8, 9, and 10 the reply was made that the company was not yet in full working order for satisfactory information to be given.

The use of gas stoves is very much restricted here, which appears singular in view of the fact that coal sells for $15 to $20 per ton, with wood and oil also very expensive, making gas much the cheaper, particularly as fires are seldom used except for cooking purposes.

GEO. F. HOLLIS,
Consul.

UNITED STATES CONSULATE,
Cape Town, July 26, 1890.

EGYPT.

REPORT BY CONSUL-GENERAL SCHUYLER.

Notwithstanding repeated endeavors to obtain, from the gas company itself and from various other sources, proper answers to the questions asked in the circular of the Department dated February 15, 1890, in regard to the manufacture and consumption of gas in Egypt, I have as yet been unable to get satisfactory information except as regards questions 1, 2, 3, 5, and 8, which I can answer as follows:

Gas is used in Alexandria, the chief seaport, and in Cairo, the capital of Egypt. The population of Alexandria is 231,396, according to the census of May 3, 1882; that of Cairo 374,838.

These cities are lighted by the "Compagnie Centrale d'Éclairage (et de Chauffage) par le Gaz," "Eugène Lebon et Cie," which has a contract with the Government which will run until near the middle of the next

century. This is a French company, its headquarters being in Paris, 26 Rue de Londres. Besides Cairo and Alexandria, it lights by gas the following cities in France, Algeria, and Spain: Algiers, Bernay, Blidah, Chartres, Dieppe, Fécamp, Granville, Honfleur, Morlaix, Mustapha, Oran, Guimper, Saint-Brieuc, Saint-Malo, Saint-Servan, Yretot, Alméria, Barcelona, Cabanal, Cadiz, Gracia, Gras de Valentia, Granada, Horta, Las Corts, Murcia, Puerto Santa-Maria, San Gervasio, San Martin, Sans, Sarria, Santander, and Valentia (Port).

I can not give the exact amount of money invested by this company in its gas works in Egypt. It has, however, a total statutory capital of 25,000,000 francs ($5,000,000), of which only 13,000,000 francs ($2,600,000) in shares have been issued.

I am informed that the candle power of the gas used here is estimated at from 3 to 7.

The price of gas in Egypt is 30 centimes per cubic meter or $1.67 per 1,000 cubic feet.

EUGENE SCHUYLER,
Consul-General.

UNITED STATES CONSULATE-GENERAL,
Cairo, May 16, 1890.

MOROCCO.

I have to acquaint you that gas is not used in Morocco.

ROBERT STALKER,
Vice-Consul.

UNITED STATES CONSULATE,
Tangier, April 8, 1890.

SIERRA LEONE.

The gas industry has not as yet been introduced in this district. Kerosene oil, candles, cocoanut oil, and palm oil being used for the ighting of houses, public buildings, and street lamps.

CORNS. MAY,
Vice-Consul.

UNITED STATES CONSULATE,
Sierra Leone, April 29, 1890.

ZANZIBAR.

The gas industry is at present undeveloped within the district of this consulate.

SETH A. PRATT,
Consul.

UNITED STATES CONSULATE,
Zanzibar. May 1, 1890.

AMERICA.

DOMINION OF CANADA.

CHATHAM.

REPORT BY COMMERCIAL AGENT WEBSTER.

There is only one gas company in my district, which is located in the town of Chatham, which place has a population of 10,000; it is called the Chatham Gas Company, limited. Amount of money invested in the industry, $53,810.88. Process of manufacture, coal. Candle power, of gas, 17. Approximate annual output, 8,000,000 feet. Number of consumers, 260. Price of gas per 1,000 cubic feet, $2.25, $1.75, $1.50 and $1. Gas stoves for heating and cooking are in use, also gas engines.

Wages of employés and hours of labor, from $800 a year and house rent free, to $10 a week, and house and gas free. Hours of labor from ten to twelve per day. Material used in the manufacture of gas, where obtained, and price at the gas works: Coal, Cleveland, Ohio, price, $3.50 per ton. Lime at Chatham, 70 cents per barrel.

W. A. WEBSTER,
Commercial Agent.

UNITED STATES COMMERCIAL AGENCY.
Chatham, Canada, March 27, 1890.

FORT ERIE.

REPORT BY CONSUL WHELAN.

This is almost purely an agricultural section, and embraces within its borders no cities or very large towns. Gas is not manufactured in any of its villages or towns. Wherever the municipalities have advanced beyond oil lamps they have adopted electric light. In part of the district natural gas is being found in quite abundant quantities, and it is being utilized at the town of Port Colborne for both heating and illuminating purposes.

JAMES WHELAN,
Consul.

UNITED STATES CONSULATE,
Fort Erie, Ontario, March 24, 1890.

HALIFAX.

REPORT BY CONSUL-GENERAL FRYE.

In this consular district there is but one gas company, which is located at Halifax. The population of the city is 40,000. The name of the company is The Halifax Gas Light Company, Limited.

Amount of money invested in the industry $400,000, that being the amount of paid-up capital.

The process of manufacture is the ordinary process followed where bituminous and cannel coal are used. I am unable to obtain a more definite statement as to the process.

The average candle power is 19.

The approximate annual output I am unable to learn. The directors and officers of the company decline to impart that information.

The number of consumers is a little below 2,000. The price of gas is $2 per thousand feet.

Gas stoves are but very little used, and only a few gas engines.

The average wages of employés is $1.25 per day. The hours of labor are about 10.

The materials used in the manufacture of gas are bituminous coal, obtained from Cape Breton, and cannel coal imported from England, or the Kentucky cannel coal, imported from the United States. The cost of the Cape Breton coal, delivered at the works is $2.65 per ton. The cannel coal is imported here only for the use of the gas company. I can not learn the exact cost.

I am informed that gas is used to a limited extent in Yarmouth, Windsor, and Pictou, towns containing a population of from 3,000 to 6,000, and that coal is the material used in its manufacture.

WAKEFIELD G. FRYE,
Consul-General.

UNITED STATES CONSULATE-GENERAL,
Halifax, March 31, 1890.

PORT SARNIA.

REPORT BY CONSUL FARRAR.

I forward the following report concerning the manufacture of gas at the only town in this consular district lighted by that method.

Port Sarnia: Population, 7,000.

The name of the gas company is the Sarnia Consumers' Gas Company. Amount invested, $35,000. Process of manufacture, water gas. Candle power of gas, 16. Approximate annual output, 4,500,000 feet. Number of consumers, 190. Price of gas per 1,000 cubic feet, $1.80.

Several gas stoves are in use. Price of gas $1.25 per 1,000 feet. Wages of employés, $10 per week. Ten hours a day's work. Material used, coke at $5.25 per ton, coal at $4 per ton, imported from the United States. Crude oil, $70 per car of 60 barrels, purchased at Petrolia, Ontario.

J. S. FARRAR,
Consul.

UNITED STATES CONSULATE,
Port Sarnia, March 28, 1890.

PRINCE EDWARD ISLAND.

REPORT BY CONSUL GEORGE, OF CHARLOTTETOWN.

Charlottetown, whose population is 12,000 to 14,000, is the only city in this province in which gas is manufactured or used, and the name of the gas company is Charlottetown Gas Light Company, having invested $58,000.

The process of manufacture is by distillation of coal in clay retorts. Average candle-power 19. Annual output about 4,000,000 feet. Consumers, 200. Price of gas $2 per 1,000 cubic feet. Gas stoves not in use here. Wages are, for stokers, $25 per month. Labor about 10 hours per day. Coal obtained in Cape Breton, $3 per ton at gas-works, is the material used in the manufacture of gas.

N. J. GEORGE,
Consul.

UNITED STATES CONSULATE,
Charlottetown, May 2, 1890.

ST. STEPHEN, NEW BRUNSWICK.

REPORT BY CONSUL GOODNOW.

Gas is not manufactured in this consular district, except for private use. This town receives its gas from the St. Croix Gas Company of Calais, Me., being brought across the toll bridge in pipes belonging to said company (a case where the manufactured article comes in free when raw material pays duty).

Name of town using gas, St. Stephen. Supplied by the St. Croix Gas-Light Company, Calais, Me. Amount of investment, $24,000. Manufactured from coal. Candle power, 18. Approximate output, 35,000,000 cubic feet; 15,000,000 feet at St. Stephen. Price of gas per 1,000 cubic feet $4; 25 per cent off to small and 50 per cent off to large consumers.

Gas stoves are not in use.

Wages of employés $1.50 per day of ten hours.

Material used in manufacture, Pennsylvania coal, at $5 per ton.

EDWARD C. GOODNOW,
Consul.

CONSULATE UNITED STATES,
St. Stephen, New Brunswick, March 22, 1890.

TORONTO.

REPORT BY CONSUL POPE.

Within the consular district of Toronto there are several towns which are lighted by gas. As these towns have not sufficient population to warrant private companies being formed, the municipal authorities put up local works and make water gas.

The city of Toronto, which has a population of some 200,000, is lighted by one company, which has the sole control of illuminating by gas, but has no rights over the Electric Light Company, which latter light is largely superseding that of gas.

The name of the Toronto company is the Consumers' Gas Company. The amount of money invested in the industry up to February 30, 1890, was $2,108,256.96. The process of manufacture is the "Lowe process and coal." The candle power of gas, 18. The approximate annual output is 500,000,000 cubic feet. The number of consumers up to March 31, 1890, was 12,454.

The following prices are charged consumers: To consumers of 200,000 cubic feet and under, per annum, $1.25 to $1.12½; over 200,000 cubic feet and up to 500,000 cubic feet, per annum, $1.15 to $1.05; over 500,000 cubic feet, per annum, $1.10 to $1. The Consumers' Gas Company claim the above prices are, with the exception of two or three places in the bituminous coal district, lower than those charged by any other gas company in America.

Gas stoves for heating and cooking are being largely used; there are about 2,000 in use in Toronto.

Of course wages vary considerably; the laborers average about $10.50 per week; stokers $13 per week, and foremen $20 to $23 per week. A day's labor is ten hours, and for six months in the year a half holiday is given on Saturday.

The material used in the manufacture of gas is crude oil (petroleum), coking and cannel coal, coke and anthracite.

The prices at the gas works are as follows: Oil, 28 cents per 100 gallons; coke, 8 cents per bushel; coking coal, $4 per ton; cannel coal, $5.50 per ton; anthracite, $4.55 per ton.

CHARLES R. POPE,
Consul.

UNITED STATES CONSULATE,
Toronto, April 29, 1890.

WINNIPEG.

REPORT BY CONSUL TAYLOR.

The manufacture and consumption of gas or electric light in this district is limited to the city of Winnipeg; population, 25,000. There are two establishments.

The "Manitoba Electric and Gas Light Company," capital, $500,000; uses Lowe process; over 20 candle-power; approximate annual output, 15,000,000 feet; number of consumers, 475; price of gas per 1,000 cubic feet, $2.70 net.

Gas stoves for heating and cooking are not much used.

Hours of labor, ten per day; wages, $1.50 to $2.50.

Material used in manufacture of gas, coal from Pennsylvania and oil from Petrolia, Ontario. Prices at gas works, $9 per ton for coal and 11

cents per gallon for oil (2¾ cents per gallon at Petrolia and 8¼ cents per gallon for freight to Winnipeg).

William Bathgatt is managing director of this company.

The other establishment at Winnipeg is the Northwest Electric Company, the manager of which, H. Cameron, has furnished the following information: Name as above; incorporated, 1889; capital stock, $100,000; present mechanical power, 325 horse-power; dynamo capacity, 16-candle-power lamps; subscribers, 200; lights installed, 2,500 16-candle power lamps; mileage line system, 50 miles; process Edison. The manager adds: "Additional dynamos and electrical apparatus are ordered, and we expect to have installed in this city within twelve months 6,000 16-candle-power lamps or their equivalent with average running capacity for 4,000 lamps."

JAMES W. TAYLOR,
Consul.

UNITED STATES CONSULATE,
Winnipeg, June 14, 1890.

MEXICO.

MEXICO CITY.

REPORT BY CONSUL-GENERAL GUENTHER.

There is only one gas company in this city, and only through them could I obtain the required information, as there are no statistics published on that subject. The gas company promised repeatedly to give me the desired data, but they have not done so, and I have therefore concluded to write this dispatch.

The City of Mexico, it is claimed, has 400,000 inhabitants, and has, as I stated before, only one gas company, known as the Mexican Gas and Electric Light Company. They have the contract to supply the city with light, and, I am told, are soon going to do away with gas and use only the electric light, as the gas is not extensively used and the quality is not of the best.

Many of the business houses use petroleum or the incandescent electric light, and in private dwellings gas is hardly ever used.

The gas is made from wood and resin, and as the wood is very expensive the gas is relatively high-priced, the average price being $7.50 (Mexican money*) per 1,000 cubic feet. For a short time coal was tried, but that was found too expensive.

In the cities of Zacetecas and Guanajuato, in this consular district, the manufacture of gas is not known.

RICHARD GUENTHER,
Consul-General.

UNITED STATES CONSULATE-GENERAL,
Mexico City, June 19. 1890.

**Mexican dollar = 92.3 cents American.*

GUAYMAS.

In no part of this consular district, are established any gas companies for the manufacture of gas, nor has any natural gas been found that has been in any way utilized for lighting or manufacturing purposes.

A. WILLARD,
Consul.

UNITED STATES CONSULATE,
Guaymas, April 9, 1890.

NUEVO LAREDO.

Gas is not used in this district. Coal oil is the most common illuminant. The incandescent electric light is in use in this city, and in some others electric light plants are being established.

WARREN P. SUTTON,
Consul-General.

UNITED STATES CONSULATE-GENERAL,
Nuevo Laredo, March 27, 1890.

PASO DEL NORTE.

There is no gas company in this consular district. This city is supplied with gas, but gets it from the El Paso, Texas, Gas Company's works. I can learn of no gas stoves for heating or cooking in use.

A. J. SAMPSON,
Consul.

UNITED STATES CONSULATE,
Paso del Norte, April 5, 1890.

PIEDRAS NEGRAS.

There is no gas manufactured in this consular district.

EUGENE O. FECHÉT,
Consul.

UNITED STATES CONSULATE,
Piedras Negras, March 29, 1890.

VERA CRUZ.

REPORT BY CONSUL HOFF.

The population of Vera Cruz is 23,800. The Vera Cruz Gas Company has a capital invested of about $80,000. The gas is manufac-

tured from gas coal from England, at a cost of $13 per ton delivered at the works. The gas is 18-candle power, and the output is about 12,000,000 cubic feet per year, at a price of $5 per 1,000 feet to consumers. It is not used for any purpose but lighting. The price of labor is $1 per day of ten hours.

JOSEPH D. HOFF,
Consul.

UNITED STATES CONSULATE,
Vera Cruz, April 16, 1890.

CENTRAL AMERICA.

GUATEMALA.

Gas is not manufactured in this Republic; mineral oils, electricity, and sperm and tallow candles being used for illuminating purposes, and wood and charcoal for cooking.

JAMES R. HOSMER,
Consul-General.

UNITED STATES CONSULATE-GENERAL,
Guatemala, April 25, 1890.

NICARAGUA.

REPORT BY CONSUL WILLS, OF MANAGUA.

Gas is not manufactured in Nicaragua. It would be too expensive with the cost of coal at $25 a ton on the coast.

The last Congress held here granted a concession to Mr. Guardian, a native, to furnish the town of Leon with electric lights, but no move has yet been taken to carry out the concession. I presume it was obtained, as many such grants are, with a view of selling the concession for a bonus.

The streets in all the towns are lighted with Pratt's Astral Oil; the same oil and candles are used in private houses. In the public rooms at the palace large chandeliers, in which candles are burned, furnish the light.

CHAS. H. WILLS,
Consul.

UNITED STATES CONSULATE,
Managua, May 8, 1890.

SOUTH AMERICA.

ARGENTINE REPUBLIC.

REPORT BY CONSUL BAKER, OF BUENOS AYRES.

Although it is now quite a century since the use of gas for illuminating purposes was first employed in England, and nearly eighty years since it was introduced into the United States, in this part of the world it is an innovation on candles and kerosene of comparatively recent date. It was not until 1853 that the first gas company was organized in the Argentine Republic; and even now there are only eight companies in the entire River Plate, the Argentine Republic having seven, Uruguay one, and Paraguay none.

The names of the cities using gas in the Argentine Republic are Buenos Ayres, having a population of over 500,000, Rosario with a population of 80,000, La Plata, the capital of this Province, with a population of 40,000, and Chivilcoy with a population of 25,000. Buenos Ayres is supplied by four companies and the other cities named by one each.

Companies.—The names of the companies which manufacture and supply gas are as follows:

The Primitive Gas Company of Buenos Ayres (Compañia Primitira de Gas de Buenos Ayres) was organized in 1853 and commenced operations in 1856. The plant is centrally located immediately upon the shore of the La Plata River and embraces a large property, which has now become immensely valuable. The original capital was £140,000 or about $700,000. Since then it has been increased to $2,500,000. The works are in every respect very complete in the matter of furnaces, retorts, condensers, purifiers, holders, and all other requisites for the production and distribution of gas, its street piping now amounting to over 300 miles. Its product of gas for the last four years was as follows:

	Cubic meters.
1886	4,608,339
1887	5,068,343
1888	6,785,684
1889	9,123,966

the amount having more than doubled in the time stated.

The receipts for gas, coke, and tar were, in 1887, $840,028; in 1888, $1,243,383, and in 1889, $1,827,129, or 117 per cent more than in 1887. The dividends declared by this company are very large, the liquid profits for the last year having amounted to the sum of $645,705.

The Argentine Gas Company (Compañia Gas Argentino) was organized in 1869. Its plant is located at Almagro, on the west side of the city. Its present capital is $1,240,000. The works are likewise very

complete. A new gasometer and purifier were erected last year and additional land purchased for extending the offices. The receipts for gas, for 1889, were $595,465.69; for coke sold, $104,857.44; for tar sold, $16,316.15; total, $716.639.28. The consumption of gas shows an increase of 28 per cent on that of the previous year. The liquid balance of profits for 1889 was $234,970, and the dividend declared was 14 per cent on the stock. Its street piping now amounts to nearly 100 miles.

The Buenos Ayres New Gas Company (Compañia Nueva de Gas de Buenos Ayres) commenced operations in 1873. It is located at Barracas, on the south side of the city. It extends over 18 acres of ground and all its works are on a grand scale. The capital of the company is £700,000, or about $3,500,000. Although the company has been in existence so short a time it already has about 180 miles of service piping, with 9,200 consumers. The gas consumed in 1889 was 344,000,000 cubic feet. As it is an English company, whose principal office is in London, I am not able to give further statistics. The company has a ten-years contract with the city for street lighting at the rate of $5.20 per 1,000 cubic feet.

The Gas Company of Belgrano (Compañia Gas de Belgrano) was organized in 1878 with a capital of $200,000 to supply the suburb of Belgrano, but since then that town has become a part of the city and the works of the company have been greatly increased, not only in the matter of holders but of supply pipes. It also affords gas to the town of Flores, 4 miles away, which now also has become a part of the city. Owing to these extensions its consumption of gas shows an increase of more than 50 per cent on that of the previous year. Its net profits in 1889 were £15,260 against £12,456 for the previous year. The dividend declared was 8 per cent and £8,000 were carried to the reserve fund.

The Gas Company of Rosario (Compañia Gas de Rosario) has been in operation for seven or eight years, and its business has grown with the wonderful growth of that city. Its capital is $1,000,000 and it has in service four gasometers of the capacity of 4,930 cubic meters, and its street piping amounts to about 25 miles, serving over 3,000 houses.

The Gas Company of La Plata (Compañia Gas de La Plata) is a recent company, which has been in operation only about five years. As not only the streets but many of the houses of La Plata are lighted by the electric light, of course the gas company of so inconsiderable a city finds at present but a limited field for its operations.

The Gas Company of Chivilcoy (Compañia Gas de Chivilcoy) commenced operations only a few months ago; and, as the town has only a small population, of course it is doing but a limited business, though, with its contract for lighting the streets, its service pipes will soon be extended through all the principal streets, and thus most of the houses will ultimately be lighted with gas.

Capital.—In regard to the amount of money invested in the gas indus-

try of the Argentine Republic, I can give no exact answer. By adding together the capital stocks of the different companies, it will be seen that the total amounts to about $8,640,000. This, however, does not, in all probability, by several millions exhibit the full amount invested, or rather expended, in the several works, since some of the companies have raised money on bond and mortgage; while as to the actual value of the various plants it is known that in the case of every company there has been a very considerable increase in the selling price of the extensive premises on which they are located. The present quotation on change of the shares of the Gas Primitive is $150 per share of $50 each; and that of the Gas Argentino is $190 per share of $100 each. I have not the figures but the stocks of the other companies are also at a premium.

Process.—The process of manufacturing gas in the Argentine Republic, I presume, is quite similar to the methods employed in the United States and England. While not assuming to be either practically or theoretically posted on the subject, I can only say that the coal is heated in long, flattened retorts, rendered air-tight, and resting immediately upon the system of furnaces. The mouths of these retorts are fitted with moveable lids, rendered air-tight, and opened only when fresh charges of coal are to be introduced. An iron pipe, rising from each one of the retorts, carries the gas into a much larger tube, running at right angles to the retorts and receiving the gas from all of them. In this main is left the tar, ammoniacal water, and other impurities which are precipitated from the gas. From this the gas is conducted into the condenser, which consists of a series of bent tubes, kept cool by streams of water passing over them. Thence the gas is passed to the purifier, where the carbonic acid and sulphuretted hydrogen are eliminated. This purifier is an iron box, into which the gas is made to pass over a mixture of slackened lime and sulphate of iron, mingled with sawdust. Thus relieved of these deleterious substances the gas is conducted to the gasometer or holder, which is an immense cylinder, closed at the top and suspended with the open end in a reservoir of water. It is made of sheet-iron plates, riveted, and coated with tar on both sides to make it air-tight. As the gas is admitted the cylinder gradually rises in the water, and the consequent pressure forces the gas out through a pipe or pipes into the street mains.

Candle power.—While I am not able to say positively, I assume that the candle power of the gas of this country, when perfectly purified, is quite the same as that of the gas produced in Great Britain, for the reason that the coal used in the process is exclusively from that kingdom. I have seen it stated that a burner consuming 5 feet of gas per hour should have an illuminating power equal to from 15 to 20 candles. Owing to the imperfect purification, however, which generally characterizes the gas manufactured here, I doubt if it has so great a power.

Output.—I am asked to give the "approximate annual output." I

suppose this means the amount of gas annually produced in the entire Argentine Republic; if so, I regret to say that I am not able to give it. The Primitive Gas Company reports that its product for 1889 was 9,123,966 cubic meters. The Buenos Ayres Gas Company informs me that its product for the same year was 344,000,000 cubic feet. From the Argentine Gas Company I have no return, but in their report they state that the value of gas consumed was $654,209; and as the price for 1889 was $5.80 per 1,000 cubic feet, it would appear that the product must have been about 114,500,000 cubic feet. I have no returns of any kind from any of the other companies.

Consumers.—I am likewise unable to state the number of gas consumers in the Argentine Republic, as none of the companies, where there is so much competition, care to make such matters public. I can only say that in Buenos Ayres it is very generally used, both for private and public illumination, it being the exception where a house, if it is on the line of streets through which there are gas mains, is not supplied with gas from some one of the four companies of this city. As there are upwards of 60,000 houses, with a population of over 500,000, it will be inferred that the army of consumers is a large one. In 1887 the number of street lamps supplied with gas was 5,079, at a cost of $245,454; while the number of lamps supplied with kerosene was 3,160, at a cost of $59,692. Since then the number of gas lamps has been largely increased, but the figures have not been published.

Price.—The present price of gas in the city of Buenos Ayres is $7.25 per 1,000 cubic feet. This, however, is in Argentine paper currency, which at the present premium on gold is equal to about $2.50 in United States currency. This is an increase of about 25 per cent on the price of 1889. I am not able to give the prices in the other gas-consuming cities of the Republic, but I think the figures are a little higher than those of Buenos Ayres.

Heating and cooking.—You inquire in regard to the use of gas stoves for heating and cooking. I can say that, in some few cases, gas has been tried in this city for heating purposes, but the expense was found to be so excessive that it was soon discontinued. For cooking, gas is employed to some extent in small families; and various patterns of gas stoves or contrivances for such purposes are on sale here, but the use is quite restricted without any probability of any great increase in the number of those who thus employ it.

Wages.—The wages of ordinary laborers employed in the gas establishments range from $20 to $50 per month, according to the positions they occupy. For skilled workmen in special departments the wages in some cases reach to $100 per month. For day laborers the usual hours of work are from 6 in the morning to 6 in the evening, with an hour's intermission at 1 o'clock; but, of course, as a large part of the work is necessarily continued through the night, there are always two relays of hands, the latter receiving an increase of wages for such work.

Materials.—The only material used for the manufacture of gas in the Argentine Republic is bituminous coal; and it all comes from Great Britain, the largest portion from Cardiff, though New Castle and Glasgow also furnish considerable quantities. It must require upwards of 200,000 tons annually to meet the requirements of the several gas companies of the country.

In regard to the prices paid by the companies I am not advised, for the reason that it is shipped under special contracts extending through long periods, made with parties abroad and the terms are always reserved. The freight paid on these shipments averaged, in 1887, about $5.16 gold per ton; in 1888, $6.80; and in 1889, $7.94, showing an increase of about $2.78 gold per ton since 1887. To outside parties in the coal trade here, cargoes of English coal during the last two years, have been delivered here at the following prices in gold: Cardiff coal in 1888, $8 to $13; in 1889, $12 to $14; Glasgow coal in 1888, $9.50 to $10.50; in 1889, $10 to 14.50; New Castle coal in 1888, $9 to $14; in 1889, $12 to $14.50. Thus far during the present year the price shows no inconsiderable increase.

The great and almost fatal drawback to the use of gas in all the interior cities of the Argentine Republic is the absolute lack of coal in the country and the great expense of procuring it from abroad; for, to the cost of getting it by sailing vessel to Buenos Ayres would have to be added the heavy expense of transporting it by rail to its ultimate destination. It has been authoritatively, if not officially, announced that bituminous coal has been discovered in some of the interior provinces of the Argentine Republic, but up to this date no mines have been opened and no "black diamonds" have come to the surface; so that for the present at least a large number of flourishing Argentine cities located in the interior, must continue to "put up with" kerosene or tallow candles.

E. L. BAKER,
Consul.

UNITED STATES CONSULATE,
Buenos Ayres, July 14, 1890.

BRITISH GUIANA.

REPORT BY CONSUL WALTHALL.

The only city in British Guiana in which gas is used for illuminating purposes is the colonial capital, Georgetown, generally known abroad simply as "Demarara," the original name of the colony in which it is situated, and which is now combined with Essequibo and Berbice, to constitute the province or colony of British Guiana. Georgetown is situated at the mouth of the Demarara River. Its population by the census of 1881 was 47,175, and is now estimated to be about 54,000.

The company supplying the gas is the Georgetown (British Guiana) Gas Company, Limited.

The capital invested is £38,000 ($184,927, or according to the valuation fixed by local usage in this colony, $182,400).

The gas is obtained by "carbonizing coal"—as the process is termed, with questionable accuracy, by the manufacturers—in clay retorts.

The standard required by contract is 12-candle power per burner, but 16-candle power is actually furnished—as is claimed by the company.

The annual output is 16,000,000 cubic feet.

The number of consumers at present is 465.

The charge to private consumers is $3.50 per 1,000 feet; to the colonial government, $2.80; to the town council, $1.60. The average paid by all consumers is estimated to be about 10 shillings, or $2.40.

The use for cooking is limited; for heating, presumably none at all. There are supposed to be about seventy small gas stoves in use in the city.

The wages of employés vary from 48 cents to $1.36 per day. The average time of labor is about 8 hours per day, but varies considerably in different branches of work.

The coal used consists of Pelan Main and Boghead Cannel, from Newcastle-on-Tyne. The cost of these at the works is, respectively, 28 shillings and 68 shillings ($6.72 and $16.32) per ton.

W. T. WALTHALL,
Consul.

UNITED STATES CONSULATE,
Demarara, May 13, 1890.

BRAZIL.

BAHIA.

REPORT BY CONSUL BURKE.

Bahia is the only city in this consular district, as I am informed, that uses gas. It is situated on the coast, or rather on the Bay of All Saints (Bahia de todos os Santos), about 13 degrees south of the equator, and has a population variously estimated from 160,000 to 220,000.

The name of the company is the Bahia Gas Company, Limited. The stockholders and the managers are chiefly, if not entirely, English; capital, £150,000; original shares, £100,000; preferred shares, £50,000.

Coal is distilled in clay retorts, and the gas is condensed in tubes under water, then passed through wet coke into the scrubber, and purified by lime and oxide of iron.

Of street lights the power is 10 candles, equal to 5 feet; London standard, 18 candles.

The annual output is estimated at 50,000,000 cubic feet.

The number of consumers is about 1,000.

For private houses the price is 9 milreis per 1,000 cubic feet, or say, in our money, about $4.50. As the estimate for each private house is about 1,000 cubic feet per month, the price to the consumer is 9 milreis, or $4.50 per month. Gas is furnished to the city at the rate of 200 reis, say 10 cents per night. There are 2,000 gas lamps, consuming nightly from 76,000 to 80,000 cubic feet—or annually some 30,000,000 cubic feet.

There are no gas stoves in use.

Stokers receive per day 2½ milreis, about $1.25. Of these there are 16. Mechanics of the first class, 3 milreis, or $1.50. Second-class mechanics, 500 reis, or 25 cents, less per day. Of those there are 6 employed by the above-mentioned company. There are 14 laborers, receiving from 1,200 to 1,500 reis, or from 60 to 75 cents per day, and 28 lamplighters.

The material used in the manufacture of gas is Newcastle coal, Wigan, and other cannel. Price at works varies with the freights; it is generally from 18 to 30 milreis per ton, or from $9 to $15.

These gas works were established in 1862. In other cities of this district in which the streets are lighted, kerosene oil is used for the purpose.

DAVID N. BURKE,
Consul.

UNITED STATES CONSULATE,
Bahia, May 22, 1890.

PARA.

REPORT BY CONSUL CLAYTON.

It is impossible for me to give the desired information in regard to gas in this district. I called on the manager of the Para Gas Company and requested him to give me data on which to prepare a report, but he declined to do so, stating that such information was only intended for the directors and shareholders of his company, and that he could not give to outsiders any information regarding what he considered to be the company's private business.

I can therefore only state that the Para Gas Company is an English concern, with a capital of £175,000, managed by a board of directors located in London, and that the said gas company has a monopoly from the State of Para for a number of years.

ROBERT CLAYTON,
Consul.

UNITED STATES CONSULATE,
Para, May 16, 1890.

RIO DE JANEIRO.

REPORT BY CONSUL GENERAL DOCKERY.

The name of the company is the Rio de Janeiro Gas Company, Limited. Capital $5,000,000.

The process of manufacture is from coal, by retorts, the same system now in use in London and formerly in the larger cities in the United States. Candle power, 16; capacity, 6,000,000 feet per day. The city, the public and all institutions in the city, except the Central Railroad and the post-office, are consumers. The price is $2.25 to $3.50 per 1,000 feet.

Practically, there are no gas stoves in use.

Wages, $1.50 per day of 10 hours each.

The material is coal from Cardiff, England, the price this year being about 52 shillings per ton, which is unusually high. It usually ranges from 40 to 50 shillings per ton.

The gas company under consideration is the Rio de Janeiro Gas Company, Limited. This has passed from the original stockholders, who were English, through various hands, and is now operated by a Belgian syndicate. They have a contract with the Government for lighting the city, the public buildings, and all charitable institutions (the latter at a reduction of 50 per cent), which contract has about twenty-four years yet to run. Under that contract the charge to the consumers (private) ranges in limit from $2.50 to $3.50 per 1,000 cubic feet, according to the amount consumed, and is to be reduced when the company has made a dividend of 10 per cent per annum. So far as gas is concerned the contract with the Government is exclusive, and it is further claimed that under it the company could exclude electric light poles and wires from the streets, but it is a point not yet determined. The other companies named are operated on the same system of manufacture and are in the hands of English stockholders. A company at Campos has also an electric light plant, and at Petropolis a company has been formed and a concession granted by which either gas or electricity can be used, which matter is now under advisement.

O. H. DOCKERY,
Consul-General.

UNITED STATES CONSULATE-GENERAL,
Rio de Janeiro, May 29, 1890.

RIO GRANDE DO SUL.

REPORT BY CONSUL BENNINGTON.

There are three cities only in this consular district that use gas for public and private illumination: Rio Grande, Pelotas, and Porto Alegre, all situated in the eastern part of the State of Rio Grande do Sul; the first having a population of 14,000, the second 24,000, and the third 44,000.

The plant for the manufacture and distribution of gas in each of the three cities belongs to one company called Companhia Rio Grandense Illuminacão da Gaz, and the capital employed in the works is the equivalent of $650,000.

The process of manufacture is the same as used in England and Germany, and retorts in the works have been imported from both countries.

The candle power of the gas is 19, and the output for the city of Rio Grande is about 8,254,000 cubic feet per annum, and costs the consumers $4.20 per thousand cubic feet.

There are 260 private houses and buildings in this city lighted with gas, but the use of gas in stoves for cooking or heating is unknown in this country.

Firemen work 12 hours per day, and receive $1.50 as wages; the gas is made from Cardiff coal which costs the company $16 per ton in the Rio Grande works. The cost of coal is about the same for Pelotas, but for Porto Alegre it is higher.

The annual output in Pelotas and Porto Alegre is proportional with Rio Grande according to the number of inhabitants, but I have not the exact figures at hand.

LEBBEUS G. BENNINGTON,
Consul.

UNITED STATES CONSULATE,
Rio Grande do Sul, May 8, 1890.

CHILE.

COQUIMBO.

REPORT BY CONSUL GRIERSON.

The city of La Serena, with a population of 14,000, has one gas company, called the Gas Company of La Serena; capital invested, $40,000, American gold.

The old process of manufacture is employed. Candle power, 16; output, 100,000 cubic feet per annum; number of consumers, 460; price per 1,000 cubic feet, $2.20. There are ten gas stoves in use. Wages, per week: Stokers, $2.10; laborers, $1.20 per day.

The material used in the manufacture of gas is Chile coal, costing $5 per ton, and cannel coal from England, costing $12.50 per ton.

J. GRIERSON,
Consul.

UNITED STATES CONSULATE,
Coquimbo, October 14, 1890.

IQUIQUE.

REPORT BY CONSUL MERRIAM.

Iquique is a seaport city of 25,000 inhabitants. The name of the company is Campañia de Alumbrado por Gas de Iquique (Iquique Gas Company); capital invested, $75,000, United States gold.

The system of manufacture is by clay retorts; brilliancy, 18½ to 20 candle power; output, 18,000,000 cubic feet (in 1889, 20,338,475 cubic feet). Price per 1,000 cubic feet: For private consumers, $3.60; public offices, $2.25; public lights in streets and squares, $2 each per month. There are no gas stoves in use.

Stokers work twelve hours in twenty-four for $4 ($2 United States gold). Other laborers in the establishment work ten hours for $2.50 and $2 ($1.25 and $1 United States gold).

The material used is Scotch cannel and Australian green ticket. The price of the last lot purchased was 44 shillings 6 pence a ton, f. o. b. in the bay, and the landing expenses were $3 (Chilean currency) per ton of 2,240 pounds, being the equivalent of $12.32 United States gold at the gas works.

J. W. MERRIAM,
Consul.

UNITED STATES CONSULATE,
Iquique, April 19, 1890.

TALCAHUANO.

REPORT BY CONSUL VAN INGEN.

The cities in this district using gas are: Talca, Chillan, and Concepcion, of about 30,000 inhabitants each. The company is styled the Talca Gas Company, etc; each being called after its own city.

Capital invested: Chillan Gas Company $108,000; the other two cities a little more.

The system in general use elsewhere is that which prevails here.

Brilliancy: 17 candle power.

Output: 7,000,000 to 8,000,000 cubic feet annually.

Consumers: In Chillan 130 private consumers and 300 public lamps. The other cities more.

Price: $3.50 (Chilian) per 1,000 cubic feet.

No gas stoves used. Employés get $2.50 (Chilean) per day of 10 hours.

The material used is coal, obtained by rail from Chronel and Latel (coal ports) costs about $17 (Chilean) the ton of 1,000 kilograms.

There are no statistics obtainable from the different cities using gas, and I have only obtained this as a favor from the owners of the Chilean gas works.

JOHN T. VAN INGEN,
Consul.

UNITED STATES CONSULATE,
Talcahuano, May 22, 1890.

ECUADOR.

REPORT BY VICE-CONSUL-GENERAL REINBERG, OF GUAYAQUIL.

Guayaquil is the only city in the Republic of Ecuador using gas, and has a population of about 35,000.

The name of the gas company is the Compania de alumbrado de Guayaquil (Lighting Company of Guayaquil).

Amount of money invested in the industry, $175,000.

The gas is manufactured mainly from Newcastle (England) coal, very little being brought from other places. Cannel coal is also mixed with this Newcastle coal, and, when out of the former, petroleum, brought from a place in this Republic, about 100 miles north of here, called St. Elena, is used to replace it.

The gas is of different strength, according to the amount of mixture in the coal; is never less, however, than 16-candle power, and in general averaging from 20 to 25.

The approximate annual output is 27,300,000 cubic feet.

About 1,040 public lights and 450 private houses use gas. The municipality, for the public lights, pays $3.15 each per month; this, as compared with what private consumers pay, equals about $2 per 1,000 cubic feet; private consumers pay $4 per 1,000 cubic feet.

There are only about half a dozen gas stoves in use in the city.

Head engineer receives $140 per month, while his assistant receives $50; machinist, $50; head stoker, $50; general stoker, $40; gas-fitters, $40; lamp-lighters, $20; head office man receives $100 per month; ordinary day laborer, 75 cents per day; the monthly pay-roll being altogether about $2,000.

Stokers are changed every four hours, and nine hours are considered a day's labor.

The Newcastle coal costs $12.50 and the cannel coal $17.50 per ton at the works, while the crude petroleum costs from 12 to 15 cents per gallon.

MARTIN REINBERG,
Vice-Consul-General.

UNITED STATES CONSULATE GENERAL,
Guayaquil, May 31, 1890.

PERU.

REPORT OF CONSUL BRENT, OF CALLAO.

The cities using gas in Peru are as follows: Lima, 7 miles from the ocean, population estimated, 140,000; Callao, on the Pacific, population 15,000; Chorrillos, population 4,000; Arequipa, capital of the department of that name, 150 miles from the ocean, population about 40,000.

The companies are named after the cities and towns where located.
The capital invested is $2,000,000 or thereabouts.
The process is that ordinarily employed.
Three and one-half cubic feet equal to 16 candle power.
The annual output is probably 8,000 cubic feet per consumer.
The consumers number 1 in every 40 inhabitants.
The price is $2.75 per 1,000 cubic feet.
No gas stoves used for heating or cooking.
Wages, according to position and class; labor is not over well paid in Peru.
The material is coal from Great Britain, the price at gas works being $5 to $7 per ton.
In a country like Peru where statistics are seldom obtainable, I have had some difficulty in obtaining the foregoing, but from the persons furnishing them I consider them to be fairly accurate and reliable.

A. M. BRENT,
Consul.

UNITED STATES CONSULATE,
Callao, April 9, 1890.

REPUBLIC OF COLOMBIA.

COLON.

Gas is not manufactured or consumed in this consular district. Electricity and coal oil occupy the whole field.

VICTOR VIFQUAIN,
Consul.

UNITED STATES CONSULATE,
Colon, April 9, 1890.

PANAMA.

Gas is not manufactured on this isthmus. A gas company did exist in this city for a few years but it was so badly managed that people quit consuming gas and fell back upon the much more reliable and more economical kerosene oil; wherefore the gas company dissolved a few months since.

THOMAS ADAMSON,
Consul-General.

UNITED STATES CONSULATE GENERAL,
Panama, April 7, 1890.

URUGUAY.

REPORT BY CONSUL HILL, OF MONTEVIDEO.

Montevideo, the capital and chief city of Uruguay, latitude 34° 54′ 29″ south, and Salto, one of the larger and more important of the country

towns, situated on the Uruguay River, facing the Argentine city of Concordia, are the only centers of population in Uruguay that are supplied with gas.

Montevideo has a population of perhaps 150,000. Salto is a place of several thousand inhabitants. The use of gas in the latter is very limited and the supply (oil gas) poor.

The only really powerful gas company in the Republic is that which supplies Montevideo. Its title is The Montevideo Gas Company, Limited, of London. The capital invested in this industry is $600,000, and the company, before electric-light plants were put in here, enjoyed a monopoly in the lighting of the city. Gas has given way, at least temporarily, and the public lights of the city, about 3,000 in number, are lighted by electricity.

The gas company obtain their gas by the ordinary process of distillation from coal. The candle power is probably not more than 12, though the officers of the gas company have put it as high as 18 to 19. Fifty million feet may be taken as a fair estimate of the annual output, and the number of consumers, approximately, 10,000, rather fewer than more if this judgment be not quite correct. The price of gas is $4, gold, per 1,000 cubic feet.

Gas stoves for heating and cooking, while not unknown here, are very rarely seen, and their sale can not be said to assume any considerable proportions.

Stokers and fitters are paid from $2 to $2.50 per day; engineers $250 per month, with house rent furnished by the company.

Ten hours constitute a day's work for employés.

Coal, as has been said, is the material used in the manufacture of gas by the Montevideo Gas Company. It is obtained from Great Britain. Probably three-quarters of the coal consumed is ordinary coal, worth $9 per ton at the gas works; the other one-quarter cannel coal, laid down at the works at a price of from $12 to $15 per ton.

F. D. HILL, *Consul.*

UNITED STATES CONSULATE,
Montevideo, May 20, 1890.

VENEZUELA.

CARACAS.

REPORT BY CONSUL BIRD, OF LA GUAYRA.

In this republic gas is only manufactured at Caracas, the capital of Venezuela, a city of about 50,000 inhabitants, situated about 8 miles directly south of La Guayra and 3,000 feet above the level of the sea. The corporation, composed of citizens of Caracas, called Compañía del Gas, has about $288,461.54 invested in the enterprise, and manufactures

coal and water gas of 24-candle power, producing annually 40,150,000 cubic feet, which is disposed of to 1,050 subscribers, at $3.85 per 1,000 cubic feet.

There are no stoves used for heating and cooking with gas.

The average wages of employés engaged in the industry is stated at $1.35 per day of 10 hours' labor.

The material used for making gas is cannel coal imported from Newport News, Va., and Westmoreland coal from Baltimore, Md. The former costs $25 per ton and the latter $17.30 per ton, delivered at the works. The values above given are stated in American gold.

The supply of gas in Caracas is generally considered of poor quality, costly, and not equal to the demand. A new and larger reservoir is being constructed that will contain a product sufficient to supply the necessities of the city.

WINFIELD S. BIRD,
Consul.

UNITED STATES CONSULATE,
La Guayra, April 7, 1890.

MARACAIBO.

In no part of this consular district have gas works been established. Maracaibo is lighted by electricity, and the only city in Venezuela using gas is Caracas. I am not able to give detailed information, but I am aware that the inhabitants of the capital complain constantly of the bad quality of the gas and its deficient illuminating power.

E. H. PLUMACHER,
Consul.

UNITED STATES CONSULATE,
Maracaibo, April 9, 1890.

WEST INDIES.

BRITISH WEST IDIES.

LEEWARD ISLANDS.

Gas is not used in the British Leeward Islands.

CHESTER JACKSON,
Consul.

UNITED STATES CONSULATE,
Antigua, April 10, 1890.

NASSAU.

No gas is manufactured or used in any portion of this colony.

THOS. J. MCLAIN, JR.,
Consul.

UNITED STATES CONSULATE,
Nassau, March 31, 1890.

DANISH WEST INDIES.

REPORT BY CONSUL TURNER, OF ST. THOMAS.

In the Danish West Indies gas is used only in the town of Charlotte Amalia, in the island of St. Thomas, the population of which is about 10,000.

The corporation which supplies the town is known as the St. Thomas Gaslight Company, limited. The capital invested is $40,000.

The process of manufacture is the coal-gas method. The candle power is from 18 to 20 candles. The annual output is 4,000,000 cubic feet. The consumers number 300. The local authorities contract for lighting the streets with gas. The price is $3, American gold, per 1,000 cubic feet. The use of gas stoves for any purpose is very limited. Employés get $5 to $8.50 gold per week, 12 hours being reckoned as a day, including meal hours. The materials used in the manufacture of gas are the Westmoreland (Pennsylvania) gas coal, which is obtained from New York, and the Cannelton (West Virginia) cannel coal, which is gotten from Newport News, Va. They cost $7.50 and $11 per ton, respectively, delivered at the gas works.

MORTIMER H. TURNER,
Consul.

UNITED STATES CONSULATE,
St. Thomas, April 10, 1890.

DUTCH WEST INDIES.

CURAÇAO.

In respect to the information required in the circular relating to the manufacture of gas, I have to report that no such industry exists in this place.

L. B. SMITH,
Consul.

UNITED STATES CONSULATE,
Curaçao, April 21, 1890.

FRENCH WEST INDIES.

GUADELOUPE.

No gas is used, or manufactured, in any city in Guadeloupe, the streets being all lighted by kerosene oil lamps.

CHARLES BARTLETT,
Consul.

UNITED STATES CONSULATE,
Guadeloupe, April 11, 1890.

MARTINIQUE.

All coal being imported to this island from the United States and England, manufacturing gas would be too expensive, and hence the latter article is unknown here. With the magnificent water power of this island I believe it would be feasible to produce electricity at a modicum of expense.

WILLIAM A. GARESCHÉ,
Consul.

UNITED STATES CONSULATE.
Martinique, April 9, 1890.

SAN DOMINGO.

PUERTO PLATA.

In no city in this district is gas used.

THOMAS SIMPSON,

UNITED STATES CONSULATE,
Pureto Plata, May 8, 1890.

SPANISH WEST INDIES.

SANTIAGO DE CUBA.

REPORT BY CONSUL REIMER.

In his consular district only this city of Santiago de Cuba, population about 50,000, enjoys the distinction of being lighted by gas. The company which furnishes the light to this city, called the Santiago Gas-light Company, is composed of resident stockholders, and Philadelphia parties, as far as the writer can ascertain, have also an interest in the affairs of the company. The city municipality owes the company

$72,000 as an old debt, and at present about $8,000 more for gas furnished during the last and current year. Although the plant has cost, the writer believes, considerably more, the company is stocked for $200,000.

Water gas is manufactured by the Flannery process, which produces a candle power of about 18.

The daily output is about 70,000 feet, or 2,555,000 annually.

The consumers number about 800, using 2,400 lamps.

The municipality pays for the lighting of 435 lanterns.

The price for 1,000 cubic feet is $4.

There are no gas stoves in use here, owing to the high price of the gas, but perhaps two or three gas engines are running.

The average wage paid to employés of the company is about $1.50 specie (gold) for 10 hours out of 24 hours' work.

Being water gas, manufactured on Flannery process, crude petroleum and coal are used. Crude petroleum costs the company, delivered at the works, 16 cents a gallon; anthracite coal about $8.50 a ton; both delivered at works, and obtained at Philadelphia, Pa. The aqueduct conducting water to this town is old and very often out of order; when it is, the water is expensive. During my administration as consul here the town has been without gas twice (two nights) owing to lack of water.

It appears that the gas company has the monopoly for lighting the city for several years to come, and for this reason the electric light has not yet been introduced.

OTTO E. REIMER,
Consul.

UNITED STATES CONSULATE,
Santiago de Cuba, March 29, 1890.

CONTINENT OF ASIA.

ASIATIC TURKEY.

SMYRNA.

REPORT BY CONSUL EMMET.

I have the honor to submit the following report:

The answers are submitted in the order of the questions propounded.

1. Smyrna, Asia Minor, and suburbs. Estimated population, 200,000.
2. Name of gas company, Ottoman Gas Company, Limited.
3. Amount of money invested in the industry, $375,000.
4. Process of manufacture, by carbonization of coal.
5. Candle power of gas, 14 to 16.
6. Approximate annual output, 45,818,000 cubic feet.
7. Number of consumers, 1,200, and 1,500 city lamps.
8. Price of gas per 1,000 cubic feet, $1.85.
9. Very few gas stoves in use.
10. Wages of laborers per day of 10½ hours, 41 cents; of stokers, 86 cents.
11. Material used in the manufacture of gas: Pelow main coal from Newcastle; price at pit from $1.75 to $3.75, according to demand. Add freight to Smyrna from $1.75 to $3; add various expenses, probably $1.75 per gross ton.

This gas company has been established about twenty-eight years, and the introduction of gas has been a tedious work.

In two directions from the gas works the mains extend about 6 miles.

The city lamps are contracted for at $18.86 per annum per lamp.

W. C. EMMET,
Consul.

UNITED STATES CONSULATE,
Smyrna, May 8, 1890.

PALESTINE.

Gas is not used or manufactured in any part of this consular district.

HENRY GILLMAN,
Consul.

UNITED STATES CONSULATE,
Jerusalem, April 21, 1890.

SYRIA.

BEIRUT.

REPORT BY CONSUL BISSINGER.

Beirut, with a population variously estimated at from 80,000 to 120,000 inhabitants, is the only city in Syria using gas. Damascus has asked for and secured a concession to introduce gas within its walls, but has not yet taken any steps towards accomplishing it.

The name of the Beirut company is the Société Ottomane du Gaz de Beyrouth (Ottoman Gas Company of Beirut).

The amount of money invested in this industry is 800,000 francs or about $160,000.

The process of manufacture of gas in the Beirut Gas Works comprises several apparatus which can be grouped in the following manner: Generating apparatus, refining apparatus, and reservoirs.

The generating apparatus comprises three furnaces, two of them having seven and one five retorts; all of the three are constructed on the system "Coze," of automatic feeding and discharging. This method has for main object to simplify manual labor. Two men are sufficient to attend to the furnaces, *i. e.*, to put coal in the retorts and keep up the fires. The principle of this apparatus is very simple. Instead of placing the retorts or closed vessels—in which distillation takes place—in a horizontal position, they are put at an angle of 23°, which is the natural slope of dry earth. The retorts are charged from above by means of a car on rails of a special form and containing 200 kilograms, 441 pounds of coal, one charge for a retort. The coal is distributed in layers of uniform thickness and the retorts is then closed. After 4 hours the lower part of the retort is opened, and by stirring with a large poker it will cause the coke—a solid residue of the distillation—to fall into iron wheelbarrows, which convey it to the outside to be extinguished.

A double economy is derived from this system: first from the saving of the manual labor and then from the arrangement of the retorts which facilitates the so-called "recuperative" heating, *i. e.* heating due to the combustion of the carbonic oxide.

Gas thus manufactured is not absolutely pure; it contains various gases—which should be eliminated—as well as liquid substances which are volatilized upon leaving the retorts.

The first refining apparatus is the "Servier" sluice cock (vanne Servier), which is so arranged as to condense the tar and to refine the gas by "shocks." This "sluice" cock is composed of iron rods fixed in a quincuncial manner, through which the gas passes. Then there are the so-called "washers" or drums in which a large number of tubes are dovetailed into each other and through which the gas must pass. Water placed in these tubes serves to retain the ammonia; this water

should, however, first be impregnated with lime. The object of the lime is to retain the carbonic acid. The gas passes next into the "refining" drums containing the "mallet" matter, composed of: (*a*) Sulphate of iron, (*b*) sulphate of lime, and (*c*) coarse poplar sawdust. This matter retains the cyanuret, the carbonic acid, and, above all, the sulphuretted hydrogen. In placing it in contact with the air it is revivified and can be used for many years. From these last apparatus the gas enters the "registering meter," thence passing into the gasometers.

The Beirut Gas Works possess two gasometers having a metallic drum of a new system. Each gasometer holds 1,000 cubic meters. The gas is finally conducted into the pressure governor, which serves to impart the necessary pressure in the city. Two centimeters (water gauge) of pressure during the day and three during the night—from sunset till morning—are generally found sufficient.

The candle power of gas it has not been possible to ascertain, but the concession accorded to the Beirut gas company stipulates that the gas in the conduits (pipes) shall be under a pressure of 2 centimeters in order to reach the burners in sufficient quantity when lighted. The gas is to be carefully refined and its illuminating power under the pressure of a water column of 2 centimeters (0.39368 American inch) and an avearge flow of 105 liters (61.027 cubic inches or 2.113 American pints, or 1.76 English pints) per hour is to equal that of a Carcel lamp (see annex) consuming 42 grams of distilled colza, or rape oil, per hour (a gram is equal to 18.756 grains troy or 15.432 grains avoirdupois).

The annual output is approximately 250,000 cubic meters.

The present number of consumers is 150.

The price of gas is 35 centimes, or about 7 cents United States currency, the cubic meter.

Gas stoves for heating and cooking are well adapted to this climate, but not over about forty or fifty are at present in use in Beirut.

The wages of employés in the Beirut Gas Works are 1.25 francs per day, or about 25 cents of our money. Work begins at sunrise and ends at sunset.

The material used in the manufacture of gas is coal from New Castle in England; its price at the gas works, in Beirut, is from 28 to 35 francs per ton, equal to $5.60 to $7.

ERHARD BISSINGER,
Consul.

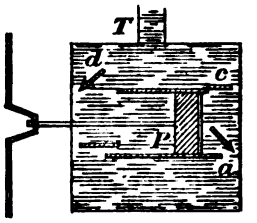
UNITED STATES CONSULATE,
Beirut, Syria, May 1, 1890.

THE CARCEL LAMP.

[Inclosure in Consul Bissinger's report.]

As the Carcel lamp mentioned in this report may not be generally known in the United States, the following notes thereon are deemed opportune:

Carcel, a watchmaker in Paris, invented in 1800 the mechanical lamp which bears his name. It consists of an oil reservoir placed at the foot of the lamp; this reservoir is divided into compartments, as shown in the following sketch.



A piston (*P*) oscillates under the action of a clockwork motion. The motion thus produced is regulated by means of a fly wheel, and continues most uniformly during a period of 10 to 12 hours. If it moves in the direction indicated by the arrow, it drives the oil back by means of the valve, and forces it to rise through the tube (*T*) to the wick. If the motion takes place in an inverse direction, it is the valve (*c*) which rises to give passage to the liquid. As to the valves (*d* and *a*) they give way to the oil sucked up in order to fill up the space left empty by the piston.

BRITISH INDIA.

BOMBAY.

REPORT BY VICE CONSUL BODE.

Gas is used in Bombay by Europeans, Parsees, Mahomedans, Hindus, etc.

The name of the gas company is the Bombay Gas Company, limited.

The amount of money invested in the industry is about $250,000.

The process of manufacture is from coal.

One gas lamp equals 14 candles.

The approximate annual output is 110,000,000 cubic feet.

The number of consumers is from 5,000 to 6,000 and it is also supplied to the Bombay municipality for lighting streets, etc.

The price of gas per 1,000 cubic feet is from 5 to 6 rupees*.

None make use of gas for heating and cooking purposes.

Wages of employés is from 8 to 12 annas (20 to 25 cents) per day, and hours of labor are about 10.

Coal is used in the manufacture of gas, obtained from England, the price of which is from rupees 20 to 25 per ton ($8.08 to $10.10).

H. E. BODE,
Vice Consul.

UNITED STATES CONSULATE,
Bombay, May 2, 1890.

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* One rupee equals 44.4 cents.

SINGAPORE.

REPORT BY ACTING CONSUL LYALL.

Singapore is the only town in my district in which gas is used. Its population last census (1881) was about 140,000, and it must now be considerably larger.

Name of gas company, the Singapore Gas Company, limited; founded, in 1862, with a capital of £100,000; registered office in London; process of manufacture, distillation of coal.

The candle power is 16 to 18; information on the point of annual output is refused. The consumption of gas in Singapore is nothing equal to that of American cities with smaller populations, where its use is general among the inhabitants. In Singapore the Asiatic inhabitants use kerosene oil only, gas being confined mainly to the lighting of streets and roads, hotels, certain public buildings, and a proportion of houses of European residents.

The gas company was granted a monopoly of the street lighting when it was first founded and this monopoly has still some years to run.

Information refused as to the number of consumers. The price of gas per 1,000 cubic feet is $3 (Straits currency), less 5 per cent. There are very few gas stoves in use. Information as to wages refused, but probably from $6 to $7 per month and upwards, according to the class or skill of workman. The hours of labor are from 6 to 11 a. m. and from 1 to 5 p. m. The material used is coal, chiefly English (west Hartly) and cannel, also Australian coal and shale, and Japan coal. Prices vary from time to time; at present they may be quoted from $11 to $9.

J. LYALL,
Acting Consul.

UNITED STATES CONSULATE,
Singapore, May 26, 1890.

CHINA.

HONG KONG.

MR. CROSS, MANAGER OF THE HONG KONG GAS COMPANY, TO VICE CONSUL WITHERS.

In reply to your favor of the 26th instant asking for some information in respect to the gas industry in this district, the answers are as follows:

This company only supplies gas in Hong Kong at present. The population you may arrive at with more accuracy than myself probably.*

Hong Kong and China Gas Company, limited, having its head office in England.

* Estimated population of Hong Kong, 215,000.—R. E. W., jr.

The capital of the company is £70,000, of which about £64,000 is called up.

The ordinary process of gas manufacture from coal.

Average candle power for 1889, 15.85 candles.

Gas sold for 1889, 39,944,200 cubic feet.

Number of private consumers is about 416.

Price of gas per 1,000 cubic feet, $3, with discounts to large consumers.

No gas stoves are used for cooking and very few for heating purposes.

We employ all Chinese labor, except on the staff, the rates being those usually paid in the colony for skilled and unskilled men.*

We use the best coals we can get at a reasonable figure, obtained from Japan, Australia, and New Zealand, and it averages about $9, delivered on the works.

F. W. CROSS,
Manager.

HONG KONG AND CHINA GAS COMPANY'S OFFICE,
Hong Kong, May 30, 1890.

NINGPO.

REPORT BY CONSUL PETTUS.

There are three large cities in this consular district, to wit: Ningpo, Hang Chow, and Wen Chow, all of which are lighted with kerosene oil. This mode of lighting is quite cheap, and from what I can gather from the officials there will be no departure from it in the near future.

THOMAS F. PETTUS,
Consul.

UNITED STATES CONSULATE,
Ningpo, May 1, 1890.

TIEN-TSIN.

REPORT BY CONSUL BOWMAN.

Tien-Tsin is in North China, about 30 miles inland from the mouth of the Pei ho river, with a population of 300 foreigners and a Chinese population of about 800,000.

The name of the company is The Tien-Tsin Gas Company, Limited, with a capital invested of 25,000 Tien-Tsin taels† (Hong Ping.)

This gas can be made from oil unsuitable for burning in lamps. It is made, however, from refined kerosene oil. The oil runs into retorts where it is evaporated as gas; from here it passes through different

*From 30 cents to $1 per day.

†One Tien-Tsin tael, $1.09 gold.

purifying apparatus to the cooler, scrubber, and purifier out into the tank. From the tank it passes through a meter and governor into the mains.

The illuminating power of oil-gas, as compared with coal gas, is as 4 to 1.

This company has been formed but 5 months, and it is impossible to give an accurate estimate as to the annual output. At present time they are making 3,300 cubic feet of gas per day.

The municipal councils use the gas for their buildings and for the lighting of the streets of the Concession, and some ten other houses (private) are already connected, and others are rapidly being connected with the mains.

On the basis that the illuminating power of this oil gas is four times greater than the coal gas, the company agree to supply private houses at $10 Mexican ($1 Mexican=75 cents, gold) per 1,000 cubic feet.

There is but one small cooking range, and that is in the house of Mr. Poulsen, one of the directors, and originator of the project.

The following are the wages paid:

		Per month.
Secretary	Mexican	$50.00
2 Fitters	Taels	15.00
3 Fitters	Mexican	15.00
1 Head fitter	Taels	30.00
3 Firemen	Mexican	10.00
1 Head lamplighter	do	10.00
4 Lamplighters	Taels	3.00
3 Coolies	do	3.00
1 Carpenter	do	4.00
1 Watchman	do	3.50
1 Watchman	do	3.00

Gas is made every second day. Fires are started every other day at 6 a. m., and drawn at 6 a. m. the next morning.

The material used is refined kerosene oil (American). One case (65 pounds net) costs 1.65 taels at the gas works. No. 5 lump coal from the Kaiping mines, at 5 taels per ton, and No. 3 coke at 6 taels per ton, are used in the furnaces.

The foreign community are progressive in ideas, and undoubtedly the opening wedge has been forced in, so that in a short time gas will be extensively used by the natives, it having already received the approval of his excellency Li Hung Chang, viceroy of this province, the most progressive official in China. It is now hoped he will use it for lighting the streets and official headquarters in the Chinese city.

As heretofore, American cooking and heating stoves have taken the lead, so it may be with the use of suitable gas stoves. A market will be found for those of cheap and medium price.

WM. BOWMAN,
Consul.

UNITED STATES CONSULATE,
Tien-Tsin, May 26, 1890.

JAPAN.

NAJASAKI.

Gas is not manufactured nor in use in this consular district.

JOHN M. BIRCH,
Consul.

UNITED STATES CONSULATE,
Najasaki, June 11, 1889.

SIAM.

The only gas manufactured in Siam is confined to a very small amount for the King's palace.

JACOB T. CHILDS,
Consul-General.

UNITED STATES CONSULATE-GENERAL.
Bangkok, June 13, 1890.

AUSTRALASIA.

REPORT BY CONSUL GRIFFIN, OF SYDNEY.

INTRODUCTION.

Upon the receipt at this consulate, on the 3d of May, of the circular dispatch from the Department of State dated February 15, directing me to prepare a report on the gas industry, I lost no time in endeavoring to procure answers to the interrogatories contained in the circular.

I prepared letters inclosing copies of the interrogatories, and forwarded them to the gas companies in all the principal cities and towns in Australasia. In nearly every instance I received from the companies valuable information.

I find that the first gaslight company in these colonies was formed in Sydney in April, 1836, and that Sydney was lighted with coal gas in May, 1841; Hobart, in Tasmania, in March, 1857; Melbourne, in Victoria, in August, 1857; Adelaide, in South Australia, in June, 1863; Brisbane, in Queensland, in 1865; while Newcastle, where the coal is produced, was not lighted with gas until October, 1867; and Paramatta, the oldest city in Australia, did not take advantage of gaslighting until August, 1872; Warrnambool, in Victoria, was supplied in August, 1874; Rockhampton, in Queensland, in December, 1874.

The most important companies are of course in Sydney and Mel-

bourne, and it will be seen from the information given below that there is a wide range in the capital—$15,086 to $7,879,871—invested in the gas industry in these colonies.

The method employed in manufacturing gas in Australasia differs very little from that in America and Europe. I have noticed that gas is conducted to a much greater distance in Australasia than in any of the cities and towns with which I am acquainted in the United States or in Great Britain. It is not infrequently the case that in cities containing not more than 30,000 or 40,000 inhabitants the system of gas mains extends 6 or 7 miles into the country; indeed, in a city like Sydney the pipes are carried a distance of fully 15 miles from the gas works. I have every reason to believe that in proportion to population more coal gas is consumed in Australia than elsewhere.

I am indebted to the secretaries and managers of the various gas companies throughout Australasia enumerated in the following pages for the valuable information there embodied; also to the government statist and to Messrs. Gordon and Gotch for statistics of a late date.

It will be observed that the interrogatories are answered in the order in which they are stated in the circular dispatch under reply.

I have given the particulars relating to cities and towns in which there are gas works in order according to the distance of each from the capital city of the respective colony.

I much desired to be in a position to report fully on the exact process of manufacture adopted by the Australian Gaslight Company, that supplies the city of Sydney and several of the suburbs surrounding with gas. The company, however, decline to supply me with information.

COLONY OF NEW SOUTH WALES.

PLACES USING GAS.

Sydney (33° 51′ 41″ south latitude, and 151° 11′ 40″ east longitude), the capital and seat of government of the colony of New South Wales, is also the parent city of Australia; founded January, 1788. The greatest length of the city is 3½ miles north and south, and breadth 3 miles east and west, the area being about 3,000 acres. The streets are lighted with coal gas at a cost of $77,864 per annum to the city corporation, while in addition the electric light is used over certain large business parts. The population of Sydney proper by the census of 1881 was 99,670, of the suburbs 120,757; total, 220,427. It is now (1890) estimated to be 129,685, and suburbs 260,315; a total of 390,000.

North Shore is a fast-extending suburb of Sydney, lying on the northern shore of Sydney Harbor. It is divided into four municipalities. The suburb is in the county of Cumberland. Transit to Sydney is by steam ferry. The population is about 20,000.

This company was established in 1876, and was reorganized in its

present status in 1883. From the commencement the output of gas has gradually increased, and from time to time the necessary extensions have been made to the plant, etc.

Manly, also a suburb of Sydney, and lying in the same direction as North Shore, is 9 miles northeast of Sydney, to which steamers run frequently during the day. Manly has a population of nearly 2,500.

Paramatta (33° 46′ south latitude, 151° 1′ east longitude) is the oldest city in New South Wales next to Sydney. It is situated on the Paramatta River, but this river is nothing more than one of the many indentations of the magnificent harbor of Port Jackson (Sydney). It is distant from the city of Sydney about 14 miles west. River steamers and railway trains keep up frequent communication. Paramatta is laid out as a regular town. This took place in July, 1790. It is the oldest town in New South Wales, and indeed in Australasia. There are now 95 miles of streets. Although perhaps out of place in this report, I may state that the first grain sown in Australasia was grown and harvested here. Municipal institutions have existed since 1861. The population by the census of 1881 was 8,433. It is now estimated at 12,000.

Liverpool (33° 54′ south latitude, 150° 58′ east longitude) is situated 22 miles south of Sydney, on Georges River, at the head of navigation, and is one of the very early government settlements in the colony of New South Wales. Municipal government was proclaimed in 1872. There are over 25 miles of streets. The population at the census of 1881 was 1,770. It is now estimated by the government statist at 12,500.

Newcastle (32° 55′ 15″ south latitude, and 151° 49′ 15″ east longitude) is the principal shipping port on the northern coast, the amount of its tonnage being frequently above that of Sydney, from which it is distant about 100 miles north. Nearly all the produce from the Hunter River district finds its way to Newcastle for shipment. Coal and wool are, however, the principal articles of export. The total output of coal in the Newcastle (northern) district during 1889 was 2,624,347 tons. The appliances for shipping coal are believed to be unequaled. Newcastle was formed into a municipality in June, 1859. It has 25 miles of streets. The population of Newcastle proper is about 25,000.

Wollongong (34° 20′ south latitude, and 150° 55′ east longitude) is 49 miles south of Sydney, and is in the county of Camden. It is a seaport and the principal harbor on the south coast of New South Wales. There is communication daily with Sydney by railway and steamers. In the district around Wollongong and cropping out along the coast line extensive seams of fire clay and ironstone abound. At least six seams of coal from 5 to 17 feet thick, all of high commercial value, are being worked, and it is said the largest ocean-going steamers make as good speed when using the coal from the mines in this district as with any other coal in the southern hemisphere. Wollongong was first *lighted with coal gas* in 1883. The population is about 8,000.

Kiama (34° 38′ south latitude, 150° 56′ east longitude) is 71 miles south of Sydney. It was formed into a municipality in 1859. One of the many coal seams near Kiama is over 22 feet thick and is of more than average quality. The population is about 3,000.

Maitland, East (32° 45′ south latitude, 151° 35′ east longitude), is 116 miles north of Sydney, in the county of Northumberland, and is situated on the Hunter River, which divides it from Maitland, West. An unlimited supply of excellent coal is found in the neighborhood. There are eight or nine pits almost constantly at work, and new coal seams are still being developed. A seam of kerosene shale is being worked at Greta, not far from Maitland.

The two parts of Maitland, east and west, are distinct municipalities. Population by the last census, 1881, East Maitland, 2,000; now, by estimate, 3,000; West Maitland, 1881, 5,300; now, 7,000. In West Maitland the consumption of gas is rapidly increasing, and when the new plant ordered from England arrives, consisting of new telescopic gasholder, contents 170,000 cubic feet, with tank, etc., and renewals of present works, the company will be enabled to meet a larger consumption and supply gas at greatly reduced rates. The company are about to apply to Parliament to obtain power to supply the town with electric light as well as gas.

Goulburn (34° 45′ south latitude, 149° 46′ east longitude), in the county of Argyle, is distant from Sydney in a southwesterly direction 134 miles at an elevation of 2,071 feet above sea level. It was made a city in 1864, and proclaimed a municipality in 1859. The city has been lighted with gas since November, 1879. Population about 12,000.

Bathurst (33° 25′ south latitude, 149° 42′ east longitude) is the principal city in the western district of New South Wales. It is situated on the south bank of the Macquarie River, 2,153 feet above sea level, and is distant from Sydney 145 miles nearly due west. Bathurst became a municipality in 1862. The city was lighted with gas in June, 1872. The population is about 10,000.

Average quantity of gas per ton of coal, 9,700 feet, and, per ton of shale, 16,000 feet. The company lays 20 feet of pipe free of charge in houses of consumers to connect gas heaters or gas fires. The consumption of gas for 1800 is estimated to equal 23,000,000 feet. Purification is effected by oxide of iron. There is a good sale for tar at 6 cents per gallon and for coke at $1.95 per ton. There is no call for the ammoniacal liquor.

Singleton (32° 24′ south latitude, 151° 7′ east longitude), in the county of Cumberland, is a municipality (since 1866) on the Hunter River, 29 miles to the north of Maitland and 148 miles northwest of Sydney. It has 11½ miles of streets. Two collieries are being worked not far from Singleton. The product is a bituminous coal, suitable for manufacturing and household purposes. The population is about 3,500.

Orange (33° 16′ south latitude, 149° 11′ east longitude) is 192 miles

west of Sydney, and is situated at an elevation of 2,843 feet above sea level. The town was proclaimed a municipality in 1860. The population is said to be 4,000.

Dubbo (32° 21′ south latitude, 148° 39′ east longitude), a rising town 281 miles northwest of Sydney, in the county of Lincoln. Proclaimed a municipality in February, 1872. It has 20 miles of streets. The population is about 3,000.

Tamworth (31° 4′ south latitude, 150° 57′ east longitude), 282 miles north of Sydney, has been incorporated since March, 1876. It has 32 miles of streets. The municipal council has lately abandoned gas, and the streets are lighted by electric lights, Tamworth being the first Australian town lighted with electricity. The population is 5,000.

Lismore (28° 42′ south latitude, 153° 20′ east longitude), on the north arm of the Richmond River, 357 miles north of Sydney, was proclaimed a municipality in 1879. The population may be taken as about 3,200.

Armidale (30° 31′ south latitude, 151° 42′ east longitude) is situated 359 miles north of Sydney, and lies 3,313 feet above sea level. It was proclaimed a municipality in 1863. Population about 3,500.

Grafton (29° 40′ south latitude, 152° 55′ east longitude) is a city 360 miles by land and 450 miles by sea northeast of Sydney, on the Clarence River, and was proclaimed a municipality in July, 1859. Coal exists all over the district round Grafton. Population, 5,000.

Wagga Wagga (35° 10′ south latitude, 147° 20′ east longitude), a pastoral town in the county of Wynyard, on the south bank of the Murrumbidgee. It is 604 miles distant southwest from Sydney. Municipal rights were granted in 1870. The population is 6,800.

NAMES OF COMPANIES, MONEY INVESTED, ETC.

The Australian Gas Light Company, of Sydney, $4,662,107.

The North Shore Gas Company, $402,460.

The Manly Gas Light Company, $72,997. The directors of this company, in their report for the year 1889, stated that the profits for the year were $8,225, and a dividend was paid at the rate of 10 per cent per annum.

The Paramatta Gas Company, $198,723.

The Liverpool Municipal Gas Works, $27,982.

The Newcastle Gas and Coke Company, $243,325.

The Wollongong Gas Light Company, $29,200.

The Kiama Gas Company, $18,493. The directors in their report for the half year ended April 5, 1890, recommended payment of a dividend equivalent to 10 per cent per annum.

Maitland, East, Gas Works, owned by the municipal council of East Maitland, $34,065.

Maitland, West, Gas Light Company, $75,431, and $6,570 reserve. The directors of this company in their report for the half year ended April

30, 1890, stated that the available profits amounted to $6,706, out of which sum a dividend at the rate of 8 per cent per annum was paid.

Goulburn Gas and Coke Company, $72,997.

Bathurst Municipal Gas Works, $92,464.

Singleton Gas and Coke Works, $57,425.

Orange Municipal Gas Works, $63,265.

Dubbo Gas Light Company, $34,066.

Tamworth Gas and Coke Company, $49,492.

Lismore Municipal Gas Works, $38,932.

Armidale Municipal Gas Works, $48,665. The municipality purchased these works on January 1, 1890. They originated with a private company nearly five years ago, and would not have been sold to the municipality, but there was a clause in the act of Parliament compelling the company to sell if the council wished to buy five years after the passing of the act. Dividends were paid by the company after the works had been opened eight months at the rate of 5 per cent per annum, and the next six months at the same rate. For the next twelve months at the rate of 7½ per cent per annum; the next twelve months at 8 per cent; then for six months at 8 per cent, and the following six months at 10 per cent per annum.

Grafton Gas Lighting Company, $38,931. This company pays a dividend of from 9 to 10 per cent per annum.

Wagga Wagga Corporation Gas Works, $72,997. For the year 1889 interest at the rate of 5 per cent on the above capital was realized, and $5,596 was carried over.

PROCESS OF MANUFACTURE.

The secretaries to the gas companies reply as follows:

Sydney: Coal.

North Shore: The coal is charged into the retorts by scoops, the gas passing through hydraulic mains into the foul main, on which a Körtings steam jet exhauster is fixed. The tar is drawn off at a point about 30 feet from the hydraulic main. The gas then enters a Graham condenser, from which it passes to a Liveseys washer and then to two purifiers filled with oxide of iron; then through the station meter and into the gas holders. To render the cost of purification less expensive, air is admitted to each of the hydraulic mains (there is one hydraulic main to each setting of retorts) to the extent of 1½ per cent of the make of gas. This air coming in contact with the hot tar in the main is carburetted, and consequently it has no deteriorating effect on the illuminating power of the gas.

Manley: Gas made from coal in the usual way, namely, coal put into retorts (fireclay) 4 feet 6 inches lengths, two to make whole retort 9 feet long 22 by 14 inches (cliffs), and passed through exhauster, condensers, washer, purifiers, and meter into holder. They are at present using oxide of iron for purification, used with sawdust, say two parts of

oxide of iron to one of sawdust. This when exposed after using and water added freely is put in the sun to dry. This rids it of the impure sulphur; when dry it is used again. This oxide lasts for a very long time with care. Some have been in use for twelve months and are still good.

Parramatta: Coals distilled in clay retorts in ordinary manner; gas washed in scrubber; purified with oxide of iron, and no lime used.

Liverpool: The works lately completed consist of a brick retort house 80 by 40 feet, having two benches, of three and four retorts each, a foul main extending around the retort house; a coil condenser and Young's scrubber of the newest design; 2 feet 6 inches by 6 feet purifiers; a gas holder 35 feet in diameter by 12 feet, to contain 15,000 cubic feet a day; a governor and about 8 miles of mains and service pipes. In addition to the above there is a building to contain the water and governor, and to afford room for offices and stores.

Newcastle: From coal by means of retorts, purified by oxide of iron and meter.

Wollongong: The gas is extracted from the coal in a retort house in earthenware retorts. Intense heat is applied by furnaces underneath, and the gas is purified by patent scrubbers and cleaners, oxide of iron and sawdust being used.

Kiama: By carbonizing Newcastle, New South Wales coal in clay retorts, passing through condensers and purifying by oxide of iron and lime.

Maitland, East: No reply.

Maitland, West: Ordinary process of manufacture of coal gas.

Goulburn: Coal and shale. Clay retorts are used and the usual condensers, etc. Precipitation by oxide of iron.

Bathurst: The ordinary coal gas carbonizing benches and fireclay retorts.

Singleton: Carbonization in clay retorts through cooling pipes to atmospheric condensers. Thence to scrubbers and on to oxide purifiers. Nothing special in manufacture.

Orange: Four benches of retorts (clay) each carrying 2 cwt. charges, 2 per cent of shale burned charged with coke, 50 per cent of which is saved as coke. Gas per ton, 10,000 cubic feet; tar, 10 gallons. Purified by 135 feet of condensing pipes into tower scrubber, containing 5 tons coke, passing 2,000 gallons of water in twenty-four hours, then through purifiers charged (1) oxide of iron, (2) with iron and lime.

Dubbo: Air furnace. Clay retorts.

Tamworth: Ordinary coal-gas process.

Lismore: Coals carbonized in retorts. Gas cleaned in tower scrubber passes through oxide of iron in purifiers into gas holder.

Armidale: Condensers; tower; scrubber; oxide of iron purifier; steam-jet exhauster; clay retorts; ordinary method.

Grafton: No reply.

Wagga Wagga: Destructive distillation in clay retorts, the gas being then purified by condensing, washing, scrubbing, and by passing through purifiers containing red oxide of iron and finished with hydrate of lime.

CANDLE POWER, OUTPUT, AND CONSUMPTION.

Name of company	Candle power.	Output.	Number of consumers.
		Cubic feet	
Sydney	17	(*)	
North Shore	16	46,000,000	1,000.
Manley	17	10,000,000	250 and 94 public lamps.
Parramatta	16½	26,000,000	750.
Liverpool	16	30,000,000	40 public lamps.
Newcastle	17½	55,000,000	3,000.
Wollongong	16	4,500,000	200 and 50 public lamps.
Kiama	16	2,000,000	86.
Maitland, East		(*)	
Maitland, West	16	16,000,000	500.
Goulburn	17	30,000,000	400.
Bathurst	17½	9,000,000	600.
Singleton	17½	6,500,000	169 and 50 public lamps.
Orange	18	6,250,000	162.
Dubbo	20	3,000,000	140 and 40 public lamps.
Tamworth	17½	4,000,000	200.
Lismore	18	3,100,000	108 and 60,000 feet per month for public lamps.
Armidale	22	3,900,000	165 and 49 public lamps.
Grafton	16	3,000,000	Not given.
Wagga Wagga	21½	14,000,000	258.

*Company will give no information.

PRICE OF GAS AND GAS STOVES.

Sydney: $1.28 per 1,000 feet. The company decline to supply information as to the use of gas stoves, etc. The sale and hiring of gas cooking stoves is largely under the control of the company.

North Shore: $2.07 per 1,000 feet, subject to the following discounts: When gas is used for lighting, 12 cents per 1,000 feet is allowed; if 4,000 feet per quarter is used for cooking only, 49 cents is allowed on all gas consumed on the premises for lighting and cooking. Three hundred and twenty gas cooking stoves are in use and the number is gradually increasing. Gas fires and bath heaters are also much in use. Separate meters are fixed in order to ascertain the quantity of gas consumed for cooking, on account of discount.

Manley: $2.43. Owing to Manley being a fashionable watering place and fluctuating consumption thirty gas stoves for cooking are in use, and a special rate of $1.95 per 1,000 feet is charged when there are stoves on the premises.

Parramatta: $1.70 per 1,000 feet, less 5 per cent per 1,000 feet discount. About 150 stoves for cooking and 40 or 50 for heating are in use.

Liverpool: The gas works at this town have only been opened lately.

Newcastle: $1.34 per 1,000 feet. Stoves are not yet generally used in the district.

Wollongong: $2.19 per 1,000 feet. Very few gas stoves are in use.

Kiama: $2.56 per 1,000 feet. Seven cooking stoves are in use.

Maitland, East: No price given. Twelve cooking stoves in use. The works have not been established more than two years and a half.

Maitland, West: $1.82 per 1,000 feet. Gas stoves are in use in many residences and business houses, and their use is gradually coming into public favor.

Goulburn: $1.82 to $2.43 per 1,000 feet, according to consumption. Forty gas stoves are in use. Wood is cheap, comparatively, and the class by whom gas stoves are most used are not numerous in Goulburn.

Bathurst: 97 cents per 1,000 feet for lighting and 91 cents for stoves. One hundred and fifty cooking and heating stoves are in use. The company buy Thomas Fletcher's and John Wright & Co.'s English stoves wholesale and sell to their customers at cost price on time payments. The gas is connected with the cooking and heating stoves free of charge.

Singleton: $2.43 per 1,000 feet. A few gas stoves are in use. The secretary of this company says: "The coal we use is of excellent quality; a laboratory test gives 11,000 feet per ton and illuminating power 18.5 candles. It is needless to say we have never reached this in the works, but our illuminating power often stands at 18 candles. Progress is rather slow in agricultural districts, and this will account for our rather low position after an existence of eight years. We have only a little more than doubled our output in that time, but as we propose extending our mains considerably during the present year, we anticipate a large increase of business. The electric-light agitation reached us, but we secured a good contract from the municipal authorities in the face of it, at a fair figure, for a term of seven years."

Orange: $2.43 per 1,000 feet. Very few gas stoves are in use. The secretary of the company says: "The price of gas to consumers previous to the purchase of the works by the municipality was $2.80 per 1,000 cubic feet. The price now is $2.43, and it could be reduced to $1.58 and pay expenses, but this would only benefit 262 consumers, and the profits are carried to other accounts, giving all ratepayers a benefit from the gas works. The probable sum which will be so earned, *i. e.*, profits, this year will be $4,867, equal to a dividend of 7 per cent. The cost of carriage of coals is excessive. The price of coal at the pit is 97 cents per ton. The carriage for 96 miles costs $1.99 per ton. Tar is used for footpaths. Coke has a ready sale."

Dubbo: $3.04 per 1,000 feet. Two gas stoves and seven gas engines are in use.

Tamworth: $2.76 per 1,000 feet. A few gas stoves and gas engines are in use. On these a discount of 20 per cent is allowed for gas consumed.

Lismore: $2.43 per 1,000 feet for lighting and $1.82 per 1,000 feet for cooking stoves. Six of these and one gas engine are in use.

Armidale: $3.24 per 1,000 feet. Only six gas stoves in use at present.

Grafton: $2.80 per 1,000 feet for lighting and $2.43 per 1,000 feet for *cooking stoves.* Fifteen of Fletcher's stoves are in use.

Wagga Wagga: $3·04 per 1,000 feet, with 15 per cent discount for payment within fourteen days. The use of gas stoves, particularly in the summer months, is rapidly increasing. $2.13 is the net price for gas for cooking stoves.

Lismore: The gas works are the property of the municipality, and have been in existence since January 1, 1888. The rate levied for maintaining the street lights is 6 cents per $4.87.

WAGES AND HOURS OF LABOR.

Sydney: From $1.70 to $2.31 for eight hours' labor.

North Shore: Stokers, $2.19 per day; fitters, $2.19 to $2.43 per day; foreman, main layer, $2.56 per day; laborers, $1.70 per day. All the men work eight hours per day. Each stoker carbonizes 30 cwt. of coal per day.

Manley: Stokers, $14.60 per week; laborers, $1.70 per day; fitters, $1.95 per day, working eight hours.

Parramatta: Stokers, eight hours, $2.31; main layers and service layers, eight hours, $2.19; laborers, $1.70, eight hours.

Liverpool: No information available. The works have lately been opened.

Newcastle: Stokers, $2.31 to $2.43; laborers, $1.70; and fitters, $2.68 per day.

Wollongong: Stokers or firemen receive $12.77 per week, which includes every alternate Sunday, eight hours per day; one week day work, next week night work; foreman receives $14.60 per week.

Kiama: Manager, $24.33 per week; secretary, $126.53 per annum. Manager and son manufacture the gas and work night and day.

Maitland, East: Manager, $15.82 per week and quarters; stokers, $1.70 per day of twelve hours; one hour allowed for breakfast and one for dinner.

Maitland, West: The day is divided into three shifts of eight hours each. Wages, 24 cents per working hour or $13.62 per week.

Goulburn: Foreman, $2.92 per day and house; stokers, $1.89 per day of eight hours; laborers, $1.70 and $1.95 per day of eight hours.

Bathurst: Stokers, $1.95 per day; laborers, $1.70 per day; gas-fitters, $2.43 per day; all work eight hours per day.

Singleton: Laborers, $2.43 per day of eight hours.

Orange: Manager, $19.47 per week; stokers, $1.95 per day of ten hours; laborers, $1.62 per day.

Dubbo: Stokers, $1.95 per day of ten hours.

Tamworth: Stokers, $12.16 per week, ten hours per day.

Lismore: Manager, $17.30 per week, with residence, fuel, and light; assistant manager, $11.92 per week; average ten hours per day.

Armidale: Stokers, $1.95 per day of twelve hours.

Grafton: Manager, $1,217 per annum; stokers, $1.95 and $2.07 per day, working twelve hours.

Wagga Wagga: Firemen, $1.95 per day of eight hours.

MATERIAL USED AND PRICES OF.

Sydney: Newcastle, New South Wales, coal, $3.71 per ton of 2,240 pounds.

North Shore (suburb of Sydney): Coal from collieries in the Newcastle, New South Wales district; average cost per ton at the works, including large and small coal, $2.92 per ton. Oxide of iron from Mittogong, New South Wales, cost per ton at the works, $9.73.

Paramatta: Newcastle, New South Wales, coal costs at the works about $3.04 per ton.

Wollongong: Equal proportions of Mount Kiera (local) and Newcastle, New South Wales, small coal. The former costs at the works $1.58, and the latter $3.41 per ton.

Newcastle: Coal from local collieries. Large at $2.80, small at $1.58 per ton.

Kiama: Coal, oxide of iron, lime, etc.

East Maitland: Coal obtained in the neighborhood; $2.07 per ton at the works.

West Maitland: Coal obtained from local collieries at $2.13 per ton; also coal from Greta mine at $2.96 per ton, and small coal from Wallsend mine at $2.17 per ton. Some cannel coal from local mines is also used at $2.68 per ton; also Hartley Vale boghead mineral or shale at $14.60 per ton.

Goulburn: Coal from different colleries, costing from $4.14 to $5.60 per ton and shale at $15.09 per ton.

Bathhust: Coal obtained from Lithgrow colliery. Price at pit 97 cents, and trainage to works $1.22 per ton. Shale from Hartley Vale mine $13.38; trainage $1.22 per ton.

Singleton: Coal from Rix Creek colliery, about 3 miles from works. Price delivered at works, small coal, $1.64 per ton. Oxide of iron from Mittagong delivered at works at $14.60 per ton.

Orange: Coal from Oakley Park colliery, 96 miles distant; price at pit 97 cents; trainage $1.99 per ton. Shale from Hartley Vale mine and oxide of iron from Mittagong.

Dubbo: Coal from Lithgow colliery at $4.38 per ton.

Tamworth: Coal from the Greta and Camberwell collieries in the Newcastle district.

Lismore: Coals from the Newcastle district. Large $5.23 and small $4.26 per ton.

Armidale: Coal from near Singleton, 310 miles, by railway. Cost at works $5.50 per ton.

Grafton: Coal from Stockton colliery, in the Newcastle district. The secretary says: "I find small coal best, but very hard to obtain. It produced 11,000 cubic feet per ton of gas without shale."

Wagga Wagga: Coal from Lithgow colliery, which costs at the works $5.37 per ton, yielding an average 10,300 cubic feet of gas per

ton. The coal costs at the pit 97 cents and $4 for trainage; also 43 cents per ton for delivery at the works. Shale is also obtained from Hartley Vale at a cost of $18.25 per ton, yielding 15,200 cubic feet of 130 candle-power gas per ton carbonized. The shale is used only to improve the quality; about 3 per cent of shale to 97 per cent of coal. This small quantity of shale increases the illuminating power of the gas 3 or 4 candle power.

COLONY OF VICTORIA.

PLACES USING GAS.

Melbourne is the capital and seat of government of the colony of Victoria. It lies in 37° 49′ 53″ south latitude, 144° 58′ 42″ east longitude. It is principally situated on the north bank of the river Yarra Yarra, in the county of Bourke. In 1836 the present site of Melbourne was known as Beargrass, and then comprised thirteen buildings; now the area of Melbourne proper is 5,020 acres, containing 74,799 inhabitants, 15,449 dwellings, and rateable property valued at $78,995,023, net annual value $7,899,502. The population within a 10-mile radius is about 458,000.

Williamstown (37° 52′ south latitude, 144° 55′ east longitude), in the county of Bourke, is a port and municipality opposite Port Melbourne, 9 miles south from Melbourne. Latest population, 14,000.

Kyneton (37° 12′ south latitude, 144° 27′ east longitude), in the county of Dalhousie, is an agricultural and gold-mining town upon the river Campaspe, lying 1,687 above sea level, 57 miles northwest of Melbourne. The town has upwards of 12 miles of streets. Population, 3,500.

Castlemaine (37° 4′ south latitude, 144° 14′ east longitude), in the county of Talbot, is 78 miles north-northwest of Melbourne. The gold diggings in the neighborhood are among the first discovered in Australia, and 420 quartz reefs have been found to be auriferous. Population, 6,000.

Ballarat (37° 33′ south latitude, 143° 52′ east longitude), in Grant County, is the leading gold-field town in Victoria, and is the next city of importance to Melbourne. It owes its present position to being the center of perhaps the richest gold-yielding district in the world. It lies 102 miles west-northwest of Malbourne, at an elevation of 1,413 feet above the sea. There are now gold mines in this district as deep as any coal pit. One of the largest pieces of natural gold in the world was taken at Bakery Hill, Ballarat, at a depth of 180 feet, and weighed 2,217 ounces 16 pennyweights. It was called the "Welcome Nugget," and was sold for $51,098. The population is estimated at 40,000.

NAMES OF COMPANIES, MONEY INVESTED, ETC.

Melbourne Metropolitan Gas Company, $7,879,871.

Williamstown Gas Company, $146,482. The profit is stated to be about 18 per cent and the dividends 16 per cent per annum.

Kyneton Shire Gas Works, $38,932.

Castlemaine Gas Company, authorized capital $121,663; capital paid up, $72,467; debentures, $13,140. The last dividend was at the rate of 6 per cent, and $5,742 were added to the reserve fund.

Castlemaine: Storage capacity, one gas holder capable of holding 25,000 cubic feet in an ordinary concrete tank, and one gas holder, capacity 15,000 cubic feet, in course of erection. The pattern or design of this holder is known as a self-contained holder, that is, the tank is of wrought iron and everything is above ground, no excavations being needed.

Ballarat Gas Company, $515,849.

PROCESS OF MANUFACTURE.

The secretaries of the companies reply as follows:

Melbourne: Hand stoking; clay retorts 20, in settings of seven; machinery stokers in preparation for some of the retort houses.

Williamston: Ordinary; direct firing steam-jet exhaust. Oxide of iron purification; clay retorts.

Kyneton: Working one bench of retorts; passes through hydraulic and condensers and purifier; latter 12 feet square; purified with lime.

Castlemaine: Distinctive distillation of coal in fire-clay retorts heated with generator furnaces; gas purified in the usual manner by condensers, washer, scrubber, and purifiers; the purifiers are charged with lime.

Ballarat: Ordinary carbonizing of coal in fire-clay retorts.

CANDLE POWER, OUTPUT, AND CONSUMPTION.

Places.	Candle power.	Output.	Consumes.
		Cubic feet.	
Melbourne	17¾	1,935,600,000	70,000 and 6,702 public lamps.
Williamstown	17	33,000,000	1,400
Kyneton	15	2,600,000	150
Castlemaine	19	21,500,000	220
Ballarat	18½	72,000,000	3,200

PRICE OF GAS AND USE OF GAS STOVES.

Melbourne: $1.14 per 1,000 feet. The company have 14,000 stoves out on hire. There are over 20,000 in use throughout the area of supply.

Williamstown: $1.52 per 1,000 feet. There is a large consumption of gas for cooking purposes, probably two-fifths of the output (33,000,000 feet). Cooking stoves are sold on time payment and are not hired out.

Kyneton: $2.80 per 1,000 feet for lighting and $2.43 for cooking stoves. Of these only a few are used.

Castlemaine: $3.47 per 1,000 feet. A discount of 15 per cent is allowed on gas used for cooking, heating, or driving gas-engines; but these are not much in use.

Ballarat: No price given. The use of gas stoves is increasing.

WAGES AND HOURS OF LABOR.

Melbourne: Wages from $1.70 to $2.43 per day of eight hours.

Williamstown: $2.07 to $2.19 per day of eight hours.

Kyneton: Stoker, $7.30 per week; lamplighter, $8.52 per week; foreman, $1.58 per day of eight hours.

Castlemaine: Stokers, $9.73 per week; boys, $4.38 per week; foreman $14.60 per week of eight hours per day.

Ballarat: Stokers, $13.62 to $14.60 per week of eight hours per day.

MATERIAL AND PRICE OF.

Melbourne: Coal supplied from Newcastle, New South Wales, costing laid down under $4.87 per ton. The secretary of the Metropolitan Gas Company says: "There is one feature connected with these gas works which is unique, namely, the gas cooking stoves. Our climate and the character of the popalation have given us a great advantage. Gas fires are also largely used." The following tables give statistics as to the industry:

THE METROPOLITAN GAS COMPANY.

Statement of coals, December 31, 1889.

Description of coals.	In store Dec. 31, 1888.	Received during year.	Coal sold during year.	Carbonized or used during year.	In store Dec. 31, 1889.
	Tons.	*Tons.*	*Tons.*	*Tons.*	*Tons.*
Common	2,120	195,907	255	189,472	8,300
Cannel	520	3,645	3	3,900	262

Statement of residual products, December 31, 1889.

Description of residual.	In store Dec. 31, 1888, estimated.	Made during year, estimated.	Used in manufacture during year, estimated.	Sold during year.	In store Dec. 31, 1889, estimated.
Coke.....tons..	100	115,951	43,541	71,160	1,350
Tar.....gallons..	2,000	2,211,437	Nil.	2,124,437	89,000
Sulphate of ammonia.....tons..	55	1,793	Nil.	1,652	196

Statement of gas made, sold, etc., December 31, 1889.

Quantity made (estimated)	cubic feet..	1,935,619,000
Quantity sold:		
Public lights and under contract	do....	119,789,000
Private lights, per meter	do....	1,558,552,000
Total quantity sold	do....	1,678,341,000
Quantity used on works (estimated)	do....	27,000,000
Total quantity accounted for	do....	1,705,341,000
Quantity not accounted for	do....	230,278,000
Number of public lamps	do....	6,702

Williamstown: Coal from New Castle, New South Wales, costing $5.19 per ton.

Kyneton: Coal from New Castle, New South Wales, costing $6.09 per ton.

Castlemaine: Coal from Stockton, near New Castle, New South Wales, price delivered at the gas works $9.30 per ton, a percentage of Hartley shale.

Ballarat: New Castle, New South Wales, coal $6.51 per ton, and shale at $20.69 per ton.

COLONY OF SOUTH AUSTRALIA.

PLACES USING GAS.

Adelaide (34° 57′ south latitude, 138° 38′ east longitude), the capital and seat of government of the colony of South Australia, is situated on the River Torrens, Port Adelaide being the shipping port. The city was founded in 1837. The total area of the city is 2,300 acres. The value of the ratable property is $2,579,245; and there are over 10,000 houses and 80 miles of streets. The public parks are very extensive. The population within a 10-mile radius from the Adelaide post-office is estimated at 130,000.

COLONY OF QUEENSLAND.

Brisbane (27° 28′ 3″ south latitude, 153° 1′ 55″ east longitude) is the capital of the colony of Queensland, and is situated 58 feet above sea level on the River Brisbane, 25 miles by water from its entrance into Moreton Bay, one of the largest bays on the Australian coast. It lies about 500 miles north of Sydney, and was first settled in 1825. The area of the city is about 2½ square miles, and the length of streets about 60 miles. Population within 5-mile radius is about 83,000.

Rockhampton (23° 24′ south latitude, 153° 28′ east longitude) is on the south bank of the Fitzroy River, about 420 miles northwest of Brisbane. About 20 miles south-southwest from Rockampton is the famous Mount Morgan gold mine, the most valuable mining property in Australasia, being worth $38,932,000 according to the present (July, 1890) market value of shares. Population about 12,900. The name of the company in Adelaide is the South Australian Gas Company; capital invested, $1,080,363.

The candle power of the gas consumed in Adelaide is 17; the output, 150,000,000 cubic feet; number of consumers, 3,600.

In Adelaide there are hundreds of gas stoves in use.

Wages in Adelaide are as follows: stokers, $1.82 to $2.07 per day of eight hours; laborers, $9.73 per week.

COLONY OF TASMANIA.

The places using gas are as follows:

Colony of Tasmania:

Hobart (42° 53′ 32″ south latitude, 147° 21′ 20″ east longitude) is the *capital and seat* of government of the Colony of Tasmania and is situ-

ated on the river Derwent, 12 miles from its mouth. The area of the city is about 1,270 acres and there are 161,150 houses. The streets are about 45 miles in length. There is a railway between Hobart at the south and Launceston at the north of this island colony, and regular steam communication between these two cities and Melbourne, Sydney, and Auckland, New Zealand. The population of Hobart is about 30,000.

The name of the company is the Hobart Gas Company; capital invested, $350,388.

The candle power of gas consumed in Hobart is 18½; output, 67,000,000 cubic feet; number of consumers, 2,600.

Price of gas in Hobart, $1.82 per 1,000 feet, and $1.62 per 1,000 feet if the consumption per quarter in one establishment is 2,000 feet and upwards.

Wages in Hobart: Firemen, $2.07, two shifts; laborers, $1.46 per day of nine hours.

The coal consumed in Hobart is brought from Newcastle, New South Wales, costing $5.36 per ton; shale, also from New South Wales, costing $18.49 per ton; oxide of iron, from the same colony, at $19.47 per ton; and lime, produced locally, at 24 cents per bushel.

COLONY OF NEW ZEALAND.

PLACES USING GAS.

Wellington (41° 16′ 21″ south latitude, 174° 47′ 25″ east longitude) is the capital and seat of government of the colony of New Zealand, and is situated on the shores of Port Nicholson, an inlet of Cooks Strait and a magnificent harbor, about 1,200 miles southeast of Sydney and 1,400 miles northeast of Melbourne, to which cities magnificent lines of steamers ply at regular intervals. In the municipal boundaries are 1,100 acres and 37 miles of streets, with 5,442 dwellings. On July 11, 1889, the electric lighting of the city was completed by the Gulcher Electric Light Company, and it is claimed that Wellington is now the best lighted city in all these colonies. The population of the city in 1888 was 25,945, and with suburbs 28,300.

Auckland (36° 50′ south latitude, 174° 50′ 40″ east longitude) is the largest city in the Colony of New Zealand and was for some years the seat of government. It is located on the southern shores of the Waitemata Harbor, an inlet of Thames Gulf. There is sufficient depth of water at the port for the largest steamers afloat. Auckland is distant from Sydney 1,315 miles east and about 1,650 miles northeast from Melbourne. With both of these cities there is regular steam communication. It has been aptly called "The Corinth of the South Pacific." In 1888 the population of the city was estimated at 37,200.

Christchurch (43° 32′ 16″ south latitude, 172° 38′ 59″ east longitude) is the third principal city in New Zealand, and is situated on the River

every case either the coal or some other material used in the manufacture of the gas has to be obtained from New South Wales. I am indebted to Mr. Harrie Wood, under secretary for mines, for the following table showing the quantity and value of coal and shale won during the year 1889 and the number of men employed in the different collieries in New South Wales.

Company.	Locality.	Men employed.			Quantity.
		Above ground.	Under ground.	Total.	
NORTHERN DISTRICT.					Tons. cw
Australian Agricultural Co	Newcastle	156	633	789	279,607
Wallsend	Wallsend	175	1,019	1,194	447,370
Newcastle Coal Co	Newcastle	95	500	595	222,960
Lambton	Lambton	68	437	505	243,256
Co-operative	Plattsburg	74	409	483	159,672
Pride of Ferndale	Tighes Hill	3	9	12	4,568
Duckenfield	Minmi	54	225	279	95,974
Brown's	....do	40	249	289	116,692
Waratah	Charlestown	59	152	211	50,860
Goose	Waratah	2	4	6	3,072
Thornton	Lambton	2	5	7	4,536
Hetton	Carrington, Newcastle	32	180	212	56,895
Brookstown	Wallsend	4	9	13	2,527
Clay Cross	Lambton	2	14	16	6,612
Wickham and Bullock Island	Wickham	35	336	371	147,092
Ferndale	....do	18	109	127	40,751
Burwood	Burwood, Newcastle	55	324	379	143,301
Hillside	....do	2	4	6	1,923
Maryville	Hexham	10	40	50	5,305
Stockton	Stockton	76	290	366	201,528
Linwood	Wickham	7	50	57	19,136
West Burwood	Merewether	6	25	31	16,580
Monkwearmouth	Minmi	19	19	38	1,227
West Wallsend	....do	20	100	120	9,635
Fern Valley	Adamstown	3	5	8	304
Rose Hill	Waratah, Newcastle	4	5	9	160
East Lambton	New Lambton	15		15	
Ebbw Vale (late New Lambton C)	Adamstown	32	119	151	44,007
South Wallsend	Cardiff	16	24	40	4,727
Summer Hill	Plattsburg	8	15	23	9,470
Northumberland Co	Fassifern	14	25	39	3,400
Great Northern	Teralba	35	270	305	74,753
Teralba	....do	14	29	43	1,708
Young Wallsend	....do	25	9	34	350
Garttee	....do	2	4	6	500
Durham	Charlestown	20	4	24	800
Morrisett Point	Swansea		2	2	736
Bloomfield	Four-mile Creek, East Maitland.	3	8	11	10,000
Sunderland	....do	1	2	3	1,250
Thornley	....do	4	11	15	8,000
Rathluba	East Maitland	1	2	3	900
East Greta	West Maitland	2	3	5	1,060
Maitland	....do	10	21	31	
South Greta (Farley)	....do	11	51	62	12,160
Leconfield	Greta	10	17	27	3,798
Greta	....do	90	386	476	133,918
New Anvil Creek	....do	2	5	7	3,662
New Park	Singleton	9	15	24	6,178
Ellesmere	....do	5	25	30	13,861
Rix's Creek	....do	1	2	3	750
Rosedale	....do	2	2	4	842
Dulwich	....do	1	2	3	727
Black Jack	Gunnedah	2	6	8	2,156
Gladstone	....do	1	2	3	703
Springfield	....do	1	5	6	1,861
Centenary	Curlewis	2	4	6	500
Total for northern district		1,343	6,216	7,559	2,624,347
SOUTHERN DISTRICT.					
Metropolitan	Hellensburg	49	74	123	14,571
Coal Cliff	Clifton	27	113	140	64,930
North Illawarra	North Bulli	48	310	358	116,576
Bulli	Bulli	51	206	257	63,299
Bellamba	....do	21	75	96	14,736

Christchurch: $1.52 per 1,000 feet. Gas engines and gas stoves for lighting and heating are largely used. The price of gas is the same as for lighting.

Dunedin: $1.82 per 1,000 feet for lighting, and $1.52 per 1,000 feet for cooking, heating, and engines. The municipal authorities do not sell or let gas stoves so long as importers are satisfied with fair profits, but desire to induce a day consumption by lower price, and so equalize labor of stokers, etc.

WAGES AND HOURS OF LABOR.

Wellington: Stokers' wages average $2.09 per day of eight hours.

Auckland: Stokers, $2.19 per day; yard men, $1.46 and $1.70 per day of eight hours.

Christchurch: $1.70 to $2.43 per day of eight hours.

Dunedin: $1.58 to $2.92 per day of eight hours; retort setters, $2.43, occasionally $2.92; bricklayers, $2.43 and $2.19; laborers, $1.58; stokers, $1.95 and $2.43.

MATERIAL AND PRICE OF.

Wellington: Coal from Greymouth, costing $5.66 per ton, and about 1 per cent of New South Wales shale, costing $16.06 per ton. "In 1889 we manufactured 11,664 cubic feet of gas per ton of coal and sold 10,876 cubic feet."

Auckland: Coal from Newcastle, New South Wales, costing with shale $4.97 per ton.

Christchurch: Coal from Grey Valley and Westport, price at works, $6.69 per ton. Lime from Mount Somers, Canterbury, $8.40 per ton, and oxide of iron from a natural deposit near Christchurch at $12.16 per ton.

Dunedin: Coal from west coast of New Zealand costing at the works $6.51 per ton, shale from New South Wales.

PROCESS OF MANUFACTURE.

Wellington: "We carbonize with half through settings of six retorts of 16 inches diameter, charged with shovels by hand. In purification we use dry lime and oxide of iron."

Auckland: Coal gas.

Christchurch: Coal gas.

Dunedin: Gas carbonized through retorts, scrubbed and condensed in usual way. Lime purifiers only. Nothing exceptional in process of manufacture.

COAL STATISTICS OF NEW SOUTH WALES.

It will be seen from the foregoing particulars gathered from the replies I have received from the different gas companies that in nearly

Composition of Australasian coals.

COALS OF NEW SOUTH WALES MINED FOR EXPORT.

	Water.	Volatile hydrocarbons.	Fixed carbon.	Ash.	Sulphur.	Specific gravity.	Coke.	Analyst
NORTHERN DISTRICT.*								
Ferndale colliery, Newcastle; ash, buff-colored.	2.10	36.22	57.24	3.84	0.60	1.296	61.08	Dixon.
Newcastle Wallsend colliery, near Newcastle; ash, reddish.	2.29	34.21	58.60	4.28	0.62	1.347	62.88	Do.
Newcastle Wallsend colliery, near Newcastle; ash, pinkish.	2.75	34.17	57.23	4.64	1.22	1.333	61.86	Liversidge.
Australian Agricultural Co.'s colliery; ash, white and heavy.	2.22	32.60	57.52	5.35	1.33	1.297	62.87	Do.
Australian Agricultural Co.'s colliery; ash, reddish.	1.65	45.45	57.84	4.44	0.62	1.286	63.28	Dixon.
Coöperative colliery, Plattsburg; ash, reddish.	2.45	34.38	58.24	4.20	0.73	1.310	62.44	Do.
Waratah colliery, near Newcastle; ash, buff-colored.	2.45	38.16	54.12	4.64	0.63	1.293	58.76	Do.
Waratah colliery, near Newcastle; ash, reddish.	2.21	36.70	55.82	4.15	1.12	1.303	59.97	Liversidge.
Newcastle Coal-mining Co.'s Glebe colliery; ash, buff-colored.	2.14	33.36	59.16	4.76	0.58	1.283	63.92	Dixon.
New Lambton colliery, near Newcastle; ash, reddish.	2.61	30.62	59.56	6.72	0.49	1.291	66.28	Do.
Minmi colliery, Hexham; ash, reddish.	2.59	33.87	56.49	5.61	1.44	1.280	62.10	Do.
Readhead Coal Co.; ash, gray	2.09	33.48	57.04	6.84	0.55	1.325	63.88	Do.
Anvil Creek colliery; ash, white .	1.74	41.10	47.90	7.80	1.46	1.323	55.70	Liversidge.
Greta colliery; ash, buff-colored ..	2.25	39.21	54.41	2.72	1.41	1.287	57.13	Do.
SOUTHERN DISTRICT.†								
Mount Keira colliery; ash, white.	1.15	23.51	64.65	9.70	0.99	1.379	75.35	Liversidge.
Mount Kembla colliery; did not coke; ash, white.	1.50	19.74	67.18	10.72	0.86	1.363	None.	Do.
Illawarra Coal Co.'s colliery; ash, gray.	0.70	22.04	68.08	8.76	0.42	1.354	76.84	Dixon.
Coal Cliff colliery; coke not very perfect; ash, grayish.	0.86	18.22	69.84	10.80	0.28	1.378	80.64	Do.
Osborne Wallsend colliery, Wollongong; ash, gray.	1.19	21.07	66.92	10.20	0.62	1.404	77.12	Do.
Bulli colliery; ash, gray	0.65	21.65	65.86	11.28	0.74	1.369	76.96	Do.
Coal Cliff colliery	1.61	19.68	68.08	10.28	0.35	1.372	78.36	Do.
WESTERN DISTRICT. (COALS MINED CHIEFLY FOR LOCAL USE.)‡								
Lithgow Valley Coal Co.'s colliery; coke hard, fairly lustrous; ash, white.	1.95	34.18	52.34	10.12	1.41	1.329	62.46	Liversidge.
Lithgow Valley Coal Co.'s colliery; ash, gray.	2.24	28.48	58.80	9.68	0.80	1.340	None.	Dixon.
Eskbank colliery; coal, rather dull; ash, grayish white.	2.70	28.78	57.88	9.88	0.76	1.329	None.	Do.
Eskbank colliery; coke, tender; ash white.	2.00	33.55	49.97	12.91	1.57	1.355	63.18	Liversidge.
Vale of Clwydd colliery; coal, rather dull; ash, gray.	2.15	35.02	52.36	9.72	0.75	1.328	None.	Dixon.
Vale of Clwydd colliery; coke, compact, fairly lustrous; ash, grayish white.	2.10	33.35	53.38	9.80	1.37	1.323	63.18	Liversidge.
Bowenfels colliery; ash, white and dense.	2.36	28.35	56.54	11.40	1.35	1.399	None.	Do.
Katoomba; coal, fairly bright and hard; coke, soft and dull; ash, grayish white.	2.90	25.82	61.34	9.26	0.68	1.326	70.60	Dixon.
Katoomba; coal, very dull colored; no true coke; ash, grayish white.	2.25	26.28	60.84	10.04	0.57	1.400	None.	Do.

* The coals of this district are all very similar in appearance, being firm and show a bright laminat structure, with traces of mineral charcoal; they are all highly bituminous, cake strongly in the fi and yield bright, hard, sonorous cokes.

† The coals of this district are characterized by a somewhat dull color, but are firm and stron They may be classed as free burning bituminous, as although they do not cake in the fire they readily coked in an oven.

‡ These coals are properly noncoking bituminous; although they all coke when fresh from the they lose this property by exposure; they are compact and vary in appearance from fairly bright *dull colored.*

Composition of Australasian coals—Continued.

NEW ZEALAND COALS.

	Water.	Volatile hydrocarbons.	Fixed carbon.	Ash.	Sulphur.	Specific gravity.	Coke.	Analyst.
Brunner Coal Co., Grey River, bituminous caking coal; average of seven.	1.59	35.68	56.62	6.11	Not det.	.....	62.73	Skey.
Coal Pit Heath, Grey River, bituminous caking coal; average of seven.	1.05	35.48	59.38	4.09	...do ...	.....	63.47	Do.
Kawakawa Colliery, Bay of Islands; average of seven.	4.18	42.63	50.15	3.04	...do ...	.....	.....	Do.
West Port Colliery Co.'s Mt. Rochfort Mine; average of seven.	2.26	34.95	60.44	2.35	...do ...	.....	.....	Do.
Malvern Hills, Canterbury; average of ten.	4.15	19.89	68.54	7.42	...do ...	.....	.....	Do.
Walton's Mine, Whangarei Harbor; average.	7.50	35.83	41.17	10.57	...do ...	.....	.....	Do.
Inangahua, Murray Creek; average.	7.68	29.49	54.73	1.08	...do ...	.....	.....	Do.
Mokihinui	7.28	27.38	46.61	2.75	...do ...	.....	.....	Do.
Collingwood Mine; average.....	1.95	28.40	57.31	4.90	...do ...	.....	.....	Do.
Pakawau; average	3.59	29.31	53.47	6.68	...do ...	.....	.....	Do.
West Wanganui; average.....	6.70	33.98	47.55	7.75	...do ...	.....	.....	Do.
Iwaka, Catlin River	4.20	27.08	59.60	1.40	...do ...	.....	.....	Do.
Mount Hamilton.....	1.68	39.44	49.08	9.80	...do ...	.....	.....	Do.
Preservation Inlet, Coal Island; average.	4.33	20.69	60.88	6.19	...do ...	.....	.....	Do.
Hydrous coals, lignite and brown coal.								
Green Island Coal Co., Dunedin; average of six.	17.95	37.78	40.30	3.97	Not det.	.....	.....	Skey.
Night-cape, Southland	21.38	45.96	29.30	3.36	...do ...	.....	.....	Do.
Shag Point Coal Co., Dunedin.....	16.57	33.70	43.15	6.58	...do ...	.....	.....	Do.
Kaion River, Whangaroa Harbor.	14.40	28.71	49.60	1.00	...do ...	.....	.....	Do.
Drury, Auckland	13.90	36.52	41.10	3.30	...do ...	.....	.....	Do.
Kupakupa mine, Waikato River; average.	15.00	29.11	47.45	2.45	...do ...	.....	.....	Do.
Mokau Harbor, upper seam.....	11.90	36.30	47.60	4.20	...do ...	.....	.....	Do.
Mokau Harbor, main seam.....	12.30	32.30	52.60	2.80	...do ...	.....	.....	Do.
Upper Wanganui River; average.	16.25	24.44	45.80	7.70	...do ...	.....	.....	Do.
Upper Buller, Coal Creek; average.	15.42	27.95	44.71	6.42	...do ...	.....	.....	Do.
Jenkins's Mine, Nelson.....	14.40	13.46	62.40	1.80	...do ...	.....	.....	Do.
Kaitangata Mine, Otago	19.61	37.25	39.41	3.73	...do ...	.....	.....	Do.
Preservation Inlet, south of Coal Island; average.	13.52	34.03	41.31	5.93	...do ...	.....	.....	Do.

QUEENSLAND COALS.

Thomas' Mine, Bundamba, Ipswich.	29.80	59.2	11.	Not det.	.....	70.1	A. C. Gregory.
Jones' Mine, Bundamba, Ipswich.	28.9	61.5	9.6	...do ...	.....	71.1	Do.
Waterstown Mine, Ipswich.....	25.2	62.0	12.8	...do ...	.....	74.8	Do.
Tivoli Mine, Ipswich	26.7	66.4	6.9	...do ...	.....	73.3	Do.
Walloon, West Moreton	41.0	42.0	17.0	...do ...	.....	69.0	Do.
Burrum Mine, Maryboro.....	31.5	64.0	4.5	...do ...	.....	68.5	Do.

Composition of Australasian coals.

COALS OF NEW SOUTH WALES MINED FOR EXPORT.

	Water.	Volatile hydrocarbons.	Fixed carbon.	Ash.	Sulphur.	Specific gravity.	Coke.	Analyst.
NORTHERN DISTRICT.*								
Ferndale colliery, Newcastle; ash, buff-colored.	2.10	36.22	57.24	3.84	0.60	1.296	61.08	Dixon.
Newcastle Wallsend colliery, near Newcastle; ash, reddish.	2.29	34.21	58.60	4.28	0.62	1.347	62.88	Do.
Newcastle Wallsend colliery, near Newcastle; ash, pinkish.	2.75	34.17	57.22	4.64	1.22	1.333	61.86	Liversidge.
Australian Agricultural Co.'s colliery; ash, white and heavy.	2.22	32.60	57.52	5.35	1.33	1.297	62.87	Do.
Australian Agricultural Co.'s colliery; ash, reddish.	1.65	45.45	57.84	4.44	0.62	1.286	63.28	Dixon.
Coöperative colliery, Plattsburg; ash, reddish.	2.45	34.38	58.24	4.20	0.73	1.310	62.44	Do.
Waratah colliery, near Newcastle; ash, buff-colored.	2.45	38.16	54.12	4.64	0.63	1.293	58.76	Do.
Waratah colliery, near Newcastle; ash, reddish.	2.21	36.70	55.82	4.15	1.12	1.303	59.97	Liversidge.
Newcastle Coal-mining Co.'s Glebe colliery; ash, buff-colored.	2.14	33.36	59.16	4.76	0.58	1.283	63.92	Dixon.
New Lambton colliery, near Newcastle; ash, reddish.	2.61	30.62	59.56	6.72	0.49	1.291	66.28	Do.
Minmi colliery, Hexham; ash, reddish.	2.59	33.87	56.49	5.61	1.44	1.280	62.10	Do.
Readhead Coal Co.; ash, gray	2.09	33.48	57.04	6.84	0.55	1.325	63.88	Do.
Anvil Creek colliery; ash, white .	1.74	41.10	47.90	7.80	1.46	1.323	55.70	Liversidge.
Greta colliery; ash, buff-colored ..	2.25	39.21	54.41	2.72	1.41	1.287	57.13	Do.
SOUTHERN DISTRICT.†								
Mount Keira colliery; ash, white.	1.15	23.51	64.65	9.70	0.99	1.379	75.35	Liversidge.
Mount Kembla colliery; did not coke; ash, white.	1.50	19.74	67.18	10.72	0.86	1.363	None.	Do.
Illawarra Coal Co.'s colliery; ash, gray.	0.70	22.04	68.08	8.76	0.42	1.354	76.84	Dixon.
Coal Cliff colliery; coke not very perfect; ash, grayish.	0.86	18.22	69.84	10.80	0.28	1.378	80.64	Do.
Osborne Wallsend colliery, Wollongong; ash, gray.	1.19	21.07	66.92	10.20	0.62	1.404	77.12	Do.
Bulli colliery; ash, gray	0.65	21.65	65.86	11.28	0.74	1.369	76.96	Do.
Coal Cliff colliery	1.61	19.68	68.08	10.28	0.35	1.372	78.36	Do.
WESTERN DISTRICT. (COALS MINED CHIEFLY FOR LOCAL USE.)‡								
Lithgow Valley Coal Co.'s colliery; coke hard, fairly lustrous; ash, white.	1.95	34.18	52.34	10.12	1.41	1.329	62.46	Liversidge.
Lithgow Valley Coal Co.'s colliery; ash, gray.	2.24	28.48	58.80	9.68	0.80	1.340	None.	Dixon.
Eskbank colliery; coal, rather dull; ash, grayish white.	2.70	28.78	57.88	9.88	0.76	1.329	None.	Do.
Eskbank colliery; coke, tender; ash white.	2.00	33.55	49.97	12.91	1.57	1.355	63.18	Liversidge.
Vale of Clwydd colliery; coal, rather dull; ash, gray.	2.15	35.02	52.36	9.72	0.75	1.328	None.	Dixon.
Vale of Clwydd colliery; coke, compact, fairly lustrous; ash, grayish white.	2.10	33.35	53.38	9.80	1.37	1.323	63.18	Liversidge.
Bowenfels colliery; ash, white and dense.	2.36	28.35	56.54	11.40	1.35	1.399	None.	Do.
Katoomba; coal, fairly bright and hard; coke, soft and dull; ash, grayish white.	2.90	25.82	61.34	9.26	0.68	1.326	70.60	Dixon.
Katoomba; coal, very dull colored; no true coke; ash, grayish white.	2.25	26.28	60.84	10.04	0.57	1.400	None.	Do.

* The coals of this district are all very similar in appearance, being firm and show a bright laminated structure, with traces of mineral charcoal; they are all highly bituminous, cake strongly in the fire, and yield bright, hard, sonorous cokes.

† The coals of this district are characterised by a somewhat dull color, but are firm and strong. They may be classed as free burning bituminous, as although they do not cake in the fire they are readily coked in an oven.

‡ These coals are properly noncoking bituminous; although they all coke when fresh from the pit, they lose this property by exposure; they are compact and vary in appearance from fairly bright to *dull colored.*

Composition of Australasian coals—Continued.

NEW ZEALAND COALS.

	Water.	Volatile hydrocarbons.	Fixed carbon.	Ash.	Sulphur.	Specific gravity.	Coke.	Analyst.
Brunner Coal Co., Grey River, bituminous caking coal; average of seven.	1.59	35.68	56.62	6.11	Not det.	.....	62.73	Skey.
Coal Pit Heath, Grey River, bituminous caking coal; average of seven.	1.05	35.48	59.38	4.09	...do ...	.....	63.47	Do.
Kawakawa Colliery, Bay of Islands; average of seven.	4.18	42.63	50.15	3.04	...do ...	.....	.....	Do.
West Port Colliery Co.'s Mt. Rochfort Mine; average of seven.	2.26	34.95	60.44	2.35	...do ...	.....	.....	Do.
Malvern Hills, Canterbury; average of ten.	4.15	19.89	68.54	7.42	...do ...	.....	.....	Do.
Walton's Mine, Whangarei Harbor; average.	7.50	35.83	41.17	10.57	...do ...	.....	.....	Do.
Inangahua, Murray Creek; average.	7.68	29.49	54.73	1.08	...do ...	.....	.....	Do.
Mokihinui	7.28	27.38	46.61	2.75	...do ...	.....	.....	Do.
Collingwood Mine; average.....	1.95	28.40	57.31	4.90	...do ...	.....	.....	Do.
Pakawau; average	3.59	29.31	53.47	6.68	...do ...	.....	.....	Do.
West Wanganui; average	6.70	33.98	47.55	7.75	...do ...	.....	.....	Do.
Iwaka, Catlin River	4.20	27.08	59.60	1.40	...do ...	.....	.....	Do.
Mount Hamilton.....	1.68	39.44	49.08	9.80	...do ...	.....	.....	Do.
Preservation Inlet, Coal Island; average.	4.33	20.69	60.88	6.19	...do ...	.....	.....	Do.
Hydrous coals, lignite and brown coal.								
Green Island Coal Co., Dunedin; average of six.	17.95	37.78	40.30	3.97	Not det.	.....	.....	Skey.
Night-caps, Southland	21.38	45.96	29.30	3.36	...do ...	.....	.....	Do.
Shag Point Coal Co., Dunedin.....	16.57	33.70	43.15	6.58	...do ...	.....	.....	Do.
Kaion River, Whangaroa Harbor.	14.40	28.71	49.60	1.00	...do ...	.....	.....	Do.
Drury, Auckland	13.90	36.52	41.10	3.30	...do ...	.....	.....	Do.
Kupakupa mine, Waikato River; average.	15.00	29.11	47.45	2.45	...do ...	.....	.....	Do.
Mokau Harbor, upper seam.....	11.90	36.30	47.60	4.20	...do ...	.....	.....	Do.
Mokau Harbor, main seam.....	12.30	32.30	52.60	2.80	...do ...	.....	.....	Do.
Upper Wanganui River; average.	16.25	24.44	45.80	7.70	...do ...	.....	.....	Do.
Upper Buller, Coal Creek; average.	15.42	27.95	44.71	6.42	...do ...	.....	.....	Do.
Jenkins's Mine, Nelson.....	14.40	13.46	62.40	1.80	...do ...	.....	.....	Do.
Kaitangata Mine, Otago	19.61	37.25	39.41	3.73	...do ...	.....	.....	Do.
Preservation Inlet, south of Coal Island; average.	13.52	34.03	41.31	5.93	...do ...	.....	.....	Do.

QUEENSLAND COALS.

Thomas' Mine, Bundamba, Ipswich.	29.80	59.2	11.	Not det.	.....	70.1	A. C. Gregory.
Jones' Mine, Bundamba, Ipswich.	28.9	61.5	9.6	...do ...	.....	71.1	Do.
Waterstown Mine, Ipswich.....	25.2	62.0	12.8	...do ...	.....	74.8	Do.
Tivoli Mine, Ipswich	26.7	66.4	6.9	...do ...	.....	73.3	Do.
Walloon, West Moreton	41.0	42.0	17.0	...do ...	.....	69.0	Do.
Burrum Mine, Maryboro.....	31.5	64.0	4.5	...do ...	.....	68.5	Do.

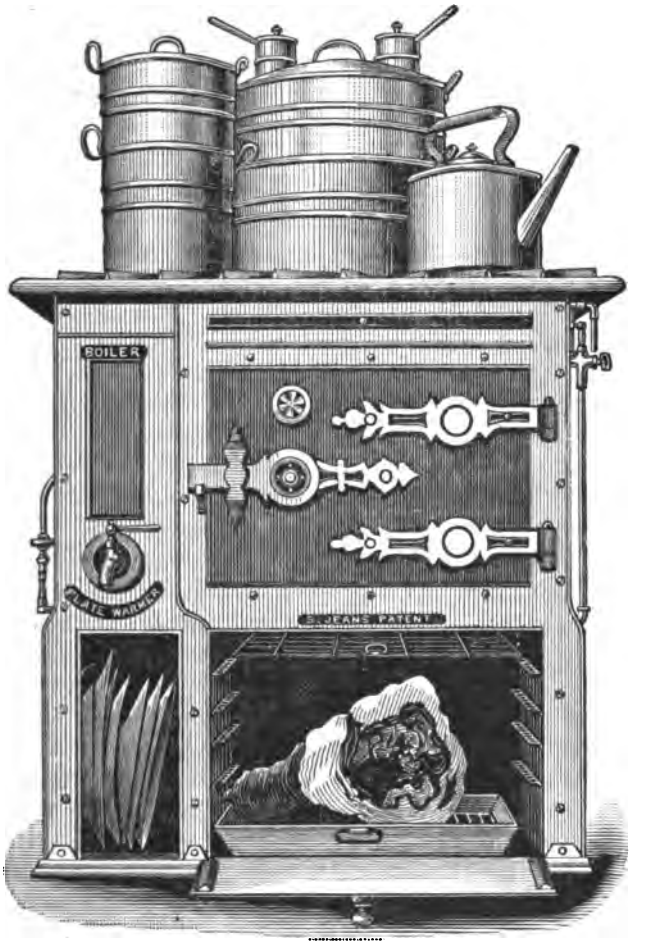
The following table gives the sizes and prices:

No.	Inside dimensions of roaster.			Hot plate.		No. of burners in hot plate.	Prices Enameled and enameled fittings.	Extra for hood and plate rack.	Terms.
	Width.	Depth.	Height.	Width.	Depth.				
	Inches.	*Inches.*	*Inches.*	*Inches.*	*Inches.*		£ s. d.	s. d.	
B407	13	13½	24	20	18½	4	5 16 6	35 0	£1 cash and £1
B410	14½	14½	25	22	20	4	7 1 0	37 6	month until p
B415	16	15	28	24	22	4	8 6 6	37 6	off.
B420	17½	16	28	26	23½	5	9 12 0	40 0	

I am told that the use of this pattern of cooking stove is condemne by some as being wasteful of gas, and there is an increasing deman for "Fletcher's Patent Indestructible Cooking Ranges." The followi table and plate show the sizes and pattern most sought after:

Number.	Usual height.	Width.	Back to front.	No. of burners.	Price.	Price without the stand.
	Inches.	*Ft. In.*	*Inches.*		£ s.	£ s.
115	30	0 21	20	4	2 15	2 5
140	30	0 23	23	4	3 0	2 10
170	30	0 28½	23	6	4 0	3 10
270	30	0 27	25	6	4 15	4 0
380	30	3 11	24	8	10 0	8 0
480	30	4 4	26	9	11 10	9 0
600	30	6 6	30	17	17 10	14 0

In the colony of Victoria the stove patented and made by S. E. Jeans, of St. Kilda, Melbourne, has considerable sale. It is made in five sizes. The following plate shows one of these stoves:



It must not be supposed that the companies mentioned in the foregoing report are the only gas-manufacturing companies in Australasia. Some gas companies can not see the use of supplying information as to their industry. A few fear that the publication of such particulars as are asked for in the dispatch under reply may lead to competition or the reduction of charges. For these reasons this report is not as full as it would otherwise be.

G. W. GRIFFIN,
Consul.

UNITED STATES CONSULATE,
Sydney, August 6, 1890.

NEW ZEALAND.

REPORT BY CONSUL CONNOLLY, OF AUCKLAND.

Many of the gas companies responded immediately, giving full and complete answers to each interrogatory submitted, while others refused to supply any information whatever, on the grounds that they did not deem it prudent to publish their private affairs. I may say, however, that all the principal cities cheerfully and unhesitatingly answered every question. The few who have refused are unimportant companies in small country towns with one or two exceptions. It is, therefore, safe to assume the cost and process of manufacture are substantially the same as those who have responded, whilst the consumption is very limited, owing to the meagerness of the population of the few towns who have refused.

Following are the names and locations of the principal gas companies of this colony, with the answers received from each.

Auckland: Population, 36,161; name of gas company, Auckland Gas Company, Limited. Amount of money invested in the industry, $916,965. Process of manufacture, coal gas. Candle power, 18. Annual out put for 1889, 97,912,000 cubic feet. Number of consumers, 4,303. On December 31, 1889, price of gas per 1,000 cubic feet, $1.58, subject to discount of 10 per cent. upon prompt cash payments.

Use of gas stoves for heating and cooking: There are 1,300 gas stoves and ranges in use in Auckland, besides 70 Otto gas engines. The price of gas for stoves and engines are the same as for lighting.

Wages of employés and hours of labor: Stokers receive $2.19 per day of 8 hours.

Material used in the manufacture of gas, where obtained, and the cost at the gas works: Coal is procured from New Castle, New South Wales, cost last year with .68 per cent. of kerosene shale also from New South Wales $4.96 per ton of 2,240 pounds.

Christchurch: Population, 50,000; name of gas company, Christchurch Gas, Coal and Coke Company, Limited. Amount of money invested, $50,000. Process of manufacture, coal gas. Candle power, 17½. Annual output, 67,000,000 cubic feet. Number of consumers, 2,400. Price of gas per 1,000 cubic feet, $1.58 net.

Use of gas stoves for cooking and heating: Gas engines and gas stoves largely used. Price of gas for both, same as lighting.

Wages of employés and hours of labor: $1.70 to $2.50 per day of 8 hours.

Material used, where obtained, and cost at the gas works: Coal from Grey Valley, New Zealand. Price at gas works, $6.44; lime from Mount Somers, New Zealand, $8.38 per ton; oxide of iron obtained at Christchurch, New Zealand, cost $7.36 per ton.

Dunedin: Population, 48,000; name of gas company, City Corporation Gas Works and Suburban Gas Company, Limited. Amount of money invested: City gas works, $500,000; suburban gas works, *$225,000.*

Process of manufacture: Ordinary, through retorts, lime precipitation only, scrubbing, condensing, etc., as usual.

Candle power of gas, 17 to 18.

Annual output: City Gas Works, 60,000 cubic feet; Suburban Gas Company, 10,000 cubic feet. Number of consumers: City and Suburban, 2,500. Price of gas per 1,000 cubic feet: $1.58 for ordinary lighting and $1.52 for gas engines and stoves.

Use of gas stoves for any purpose very limited, as gas manufacturers do not sell or let appliances.

Wages of employés and hours of labor: 8-hour shifts. Stokers wages, $2.06 per day; ordinary laborers, $1.58 for 8 hours work.

Material used in the manufacture of gas, where obtained, and price at gas works: Greymouth coal from west coast of New Zealand, price, $6.32 per ton delivered. Lime locally manufactured, cost at works, $6.07 per ton.

Wellington: Populatian, 29,365; name of gas company, Wellington Gas Company, Limited. Amount of money invested, $665,000.

Process of manufacture: Carbonized with half-through settings of 6 retorts of 16 inches diameter, charged with shovels by hand. In purification dry lime and oxide of iron are used.

Candle power: Average illuminating power, 17 candles.

Annual output: 75,000,000 cubic feet. Number of consumers, 2,900. Price per 1,000 cubic feet, $2.43, but for cash within 15 days the price is reduced to $1.82 per 1,000 cubic feet.

The use of gas heating and cooking stoves very slowly extending.

Wages of employés and hours of labor: Stokers' wages average $2.06 per day of 8 hours.

The materials used in the manufacture of gas are Greymouth coal, costing at the gas works $5.65 per ton, with about 1 per cent of Sydney shale, costing $16.05 per ton. In 1889 the average number of cubic feet of gas manufactured per ton of coal was 11.664 feet.

Masterton.—Population, 3,300. Name of gas company, Masterton Gas Gas Company, Limited. Amount of money invested, $47,500.

Process of manufacture: Ordinary process, carbonization of coal. Annual output, 2,000,000 cubic feet. Number of consumers, 150. Price of gas 1,000 cubic feet, $2.19 for gas stoves and engines, and for lighting, $2.43. Use of gas stoves limited, only two gas engines used in the town, one by each of the newspaper publishers. Candle power of gas, 18 to 20. Wages of employés and hours of labor, $5.54 and $5.65 per week, and found; 12 hours constitute a day's work. Material used, where obtained, and cost at the gas works: Westport coal from Grey Valley Company, New Zealand; lime from Mauriceville, New Zealand; cost of coal at works, $8.51; cost of lime, delivered, $9.73.

New Plymouth.—Population, 2,900; name of gas company, New Plymouth Gas Company, Limited. Amount of money invested, $50,000.

Process of manufacture: Ordinary coal process, through retorts, with shale *and oxide of iron.* Candlepower of gas, 19. Annual output,

3,000,000 feet. Consumers, 180. Price of gas 1,000 cubic feet, $3.04 net; large consumers, $2.79 to $2.50; gas stoves, $2.50. Very few gas stoves in use. Wages of employés and hours of labor: Manager, $1,325 per annum; secretary, $375; two men $1.94 each per diem of 12-hour shifts.

Material used and where obtained: Westport, New Zealand, coal; cost at works, $6.56.

Timaru.—Population, 4,000. Name of gas company, "Timaru Gas Company." Amount of money invested, $65,000.

Process of manufacture: Destructive distillation of coal. Candle power of gas, 18.50. Annual output, 7,000,000 cubic feet; 350 consumers. Price of gas per 1,000 cubic feet, $3.20, $2.50, and $1.58. There are seventy gas stoves used in this city.

Employés receive $1.94 per day of 8 hours. Material used, etc.: Greymouth coal; cost at gas works, $6.80.

Nelson.—Population, 7,777; name of gas company, Corporation Gas Works. Amount of money invested, $75,500. Candle power of gas, gas, 23, with 1,320 consumers. Cost of gas per 1,000 cubic feet, $2.02 for lighting and $1.41 for cooking, etc. About one-fourth the gas consumed is used for cooking and heating in gas stoves.

Wages of employés: Stokers, $14.59 per week of 8-hour shifts. Material used, etc.: Coal obtained from Collingwood, New Zealand; cost at works, $5.10 per ton; cost of lime, delivered, 30 cents per bushel.

Wanganui: Population, 5,000. Name of gas company, Wanganui Gas Company, limited. Amount of money invested in the industry, $70,000.

Process of manufacture: The ordinary process where coals alone are used, *i. e.*, fire-clay retorts, condensers, scrubbers, and purifying boxes.

Candle power, 19 to 21. Annual output, 6,000,000 cubic feet. Four thousand consumers. Price of gas per 1,000 cubic feet, $2.92 for lighting and $1.58 for stoves and ranges. A number of gas stoves are used for cooking and a few gas engines.

Employés receive $1.94 per day for eight hours' work. Coals for the manufacture of gas received from Brunnerton, New Zealand; oxide of iron from New South Wales.

Thames: Population, 8,000. Name of gas company, Thames Gas Company, limited. Amount of money invested, $94,825.

Process of manufacture, ordinary coal process. Candle power, 18. Annual consumption, 48,000,000 cubic feet; 450 consumers.

There are no cooking or heating gas stoves.

Wages of employés, $1.94 per day of twelve-hour shifts.

Coal for gas manufacture obtained from New South Wales and Greymouth, New Zealand.

JNO. D. CONNOLLY,
Consul.

UNITED STATES CONSULATE,
Auckland, New Zealand, July 1, 1890.

CONTINENT OF EUROPE.

AUSTRIA-HUNGARY.

BOHEMIA.

REPORT BY COMMERCIAL AGENT HAWES, OF REICHENBERG.

After so long delay I am now able to comply with the Department's circular of February 15 last. It has taken a long time to collect the information from the various towns in this district.

Names, locations, and populations of cities using gas: Arnan, Aussig, Bodenbach, B. Aicha, B. Leipa, Dux, Gablonz, Hohenelke, Jungbunzlan, Königgrätz, Königinhof, Leitmeritz, Reichenberg, Rumburg, Schönan near Töplitz, Tetschen, Trautenau, and Warnsdorf—all in Bohemia and having a total population of 168,245.

The names of the gas companies I have been unable to obtain.

The amount of capital invested is 1,915,900 florins, say $766,360.*

In Aussig, Dux, and Schönan (including Töplitz) the gas is made from bituminous coal (brown coal). In the other cities anthracite coal is used.

The gas is between 12 and 19 candle power.

The number of consumers, with the exception of municipalities and great factories, is 2,324, and besides this 2,171 burners which may or may not be in use.

The price of gas per 1,000 cubic meters is, for brown-coal gas, 80 to 100 florins; for anthracite-coal gas 100 to 365 florins.

Gas stoves are not used.

The weekly wages of workmen vary from 5.38 to 9.08 florins for from ten and one-half to twelve hours' work daily.

Brown coal is obtained from Bohemia, and there is used for gas manufacture 85,400 meter centners per year, costing 23,300 florins. Anthracite comes from Prussian Silesia and Bohemia, and amounts to 91,700 meter centners, worth 95,500 florins.

JOHN B. HAWES,
Commercial Agent.

UNITED STATES COMMERCIAL AGENCY,
Reichenberg, June 30, 1890.

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*Commercial Agent Hawes estimates the florin at 40 cents American.

BELGIUM.

ANTWERP.

REPORT BY CONSUL STEUART.

I regret to say that it is not in my power to answer the principal questions propounded in the circular in regard to the gas industry or to give any information that will be of service to anyone interested.

The gas company publishes no reports, and a visit to the director was met with a polite but positive refusal to talk of the affairs of the company or give any details in regard to it.

The city of Antwerp and suburbs under its jurisdiction are lighted by the Imperial and Continental Gas Company of London, who have established their works at three different points, namely, in the southern part of Antwerp, in Zuremborg, and in Merxem, distributing the gas respectively in the city proper of Antwerp, in Berchem, Zuremborg, Borgerhout, St. Willebrord, and Merxem, all being suburbs of Antwerp.

The contract between the city and the aforesaid company has many years yet to run, and grants a monopoly for the lighting of the city. It stipulates the lighting power of the gas to be 14 candles, which is usually exceeded, the average power being about 17 candles, and fixes the price to private consumers at 23 centimes per cubic meter. The price to be paid for lighting the public streets, squares, and docks is fixed at 1 centime per hour and per bec. This price, however, is limited to the number of 6,570 becs; all above that number are to be charged at the rate of 1¾ centimes per hour and per bec. The number of becs or jets in use on the 31st of December, 1887, was 6,558.

On the 1st of January, 1888, a modification was made in the tariff as follows: The price to private consumers was reduced to 18 centimes per cubic meter, with the following discounts, viz: 3 per cent on a yearly consumption of 5,000 cubic meters; 5 per cent on 10,000 cubic meters; 7 per cent on 18,000 cubic meters; 9 per cent on 30,000 cubic meters; 10 per cent on 60,000 cubic meters; 11 per cent on 80,000 cubic meters.

It is also stipulated that the price is to be regulated again on the 1st of July 1891, 1900, and 1909, but it is understood that the price is in no case to be more than 17 centimes per cubic meter from the 1st of July, 1891, to July, 1900.

The contract with the gas company prevents any use of electricity for public lighting, and although the price now paid for gas is much lower, as stated above, than it was two years ago, it is still much higher than the price paid in the city of Brussels, where the works are owned by the city.

The great improvements that have been made in the manufacture of lamps for burning petroleum, their ornamental appearance, as well as

their satisfactory lighting power, have induced many public establishments and also private parties to bring them into use as being much more economical than gas.

JOHN H. STEUART,
Consul.

UNITED STATES CONSULATE,
Antwerp, May 20, 1890.

BRUSSELS DISTRICT.

REPORT BY CONSUL ROOSEVELT.

The city of Brussels is composed of Brussels proper, having a population of 174,686, and nine adjacent communes, with a total population of 469,459.

Brussels has its own gas works, maintained by the municipality. The suburbs are supplied by the Company General and Imperial Continental Gas Company.

Gas is obtained by the decomposition of coal by heat. The coal is heated in angular cylinders holding about 200 pounds of broken coal. The gas is passed from the cylinders into coolers, is then purified and ready for use. Two hundred pounds of coal yield on an average about 25 cubic meters of gas, 8 pounds of coal tar, and 2⅞ bushels of coke. About one-third of the coke thus obtained is employed in heating the cylinders; the remainder is sold for domestic use.

The candle power is 7½ candles, or 105 quarts of gas per hour. Approximate annual output of the city of Brussels, 14,226,787.36 francs. Number of consumers, 19,152.

Other gas companies in this consular district refuse to give information as to the output or number of consumers in any particular locality.

PRICE OF GAS.

The price of gas differs more or less according to locality, varying 10 to 25 centimeters per cubic meter, as follows:

In the city of Brussels, day consumption, 10 centimes per cubic meter; night consumption, 15 centimes per cubic meter. The suburban consumers of Etterbeek, Forest, St. Gilles, Ixelles, Kockelberg, Molenbeek, and Uccle, 15 centimes per cubic meter; St. Jean-Ten-Noode, 18 centimes; Schaerbeek, 20 centimes; and Laeken, 25 centimes per cubic meter.

GAS STOVES.

The employment of gas stoves for heating and cooking annually increases. I am unable to ascertain the number in use, but am informed that, although the sale of gas stoves for heating is extensive, it is some 75 per cent less than the sale of gas stoves for culinary purposes.

PERMANENT EXPOSITION.

The Belgian Gasfitters' Association have a permanent exposition in the city of Brussels, of all kinds of gas apparatus. The object of the association is the employment of gas as fuel, and to this end it has recently instituted a free course of practical cooking, which is largely attended. During the year 1889 the association sold 10,000 francs' worth of various stoves, besides renting out 257 cooking and 103 heating stoves and 139 gas ovens.

WAGES.

Wages paid to workmen employed in the Brussels gas works vary from 3 to 5 francs per day for 11 hours' work. In the provinces of Brabant, Hainant, and Namur, 11 and 12 hours' labor is exacted for wages varying from 2 to 4.50 francs per day.

COAL.

Coal only is used in the manufacture of gas in this district. It is obtained principally from native mines, with small importations from France and England, delivered at the works on an average of 14 francs ($2.69) per ton.

GAS COMPANIES IN BELGIUM.

Province.	Cities and communes.	Population.	Name of company.	Capital.
				Francs.
Brabant	Brussels	174,686	Brussels Gas Works	14,226,787
Do	Anderlecht-Cureghem	31,109	The Company General	20,000,000
Do	Louvain	38,374	do	
Do	Etterbeek	16,715	Imperial Continental Gas Association	95,000,000
Do	Forest	5,330	do	
Do	St. Gilles	41,100	do	
Do	Ixelles	44,715	do	
Do	Kockelberg	6,282	do	
Do	Molenbeek St. Jean	48,656	do	
Do	Ucole	12,680	do	
Do	St. Josse-Ten-Noode	30,101	Compagnie Anonyme du Gas de St. Josse-Ten-Noode.	2,400,000
Do	Schaerbeek	51,941	do	
Do	Laeken	24,090	do	
Do	Hal	10,135	do	
Do	Vilvorde	9,420	do	
Do	Nivelles	10,788	Gaz Franco Belge	1,000,000
Do	Tirlemont	14,990	Ve de Bronwer	
Hainant	Ath	9,509	Compagnie General du Gaz pour la France et Etrangér.	20,000,000
Do	Roux-Courcelles	20,420	do	
Do	Soignies	8,683	do	
Do	Bascoup	2,100	Société Anonyme d'Eclairage du Centre	3,000,000
Do	Baume	1,500	do	
Do	Bracqueynies	4,110	do	
Do	Carnière	5,884	do	
Do	Hain St. Paul	4,549	do	
Do	Hain St. Pierre	3,400	do	
Do	Houdeng-Aimeries	6,460	do	
Do	Chapelle-Herlaimont	5,463	do	
Do	Houdeng-Goegnies	5,803	do	
Do	La Hestre	3,405	do	
Do	La Louvière	13,530	do	
Do	Manaze	2,940	do	
Do	Marienvant	2,500	do	
Do	Morlanwels	7,004	do	
Do	Basau	9,494	Société Anonyme d'Eclairage du Bassin houiller de Mons.	1,522,000

GAS COMPANIES IN BELGIUM—Continued.

Province.	Cities and communes.	Population.	Name of company.	Capital.
				Francs
Hainant	Cuesmes	7,949	Société Anonyme d'Eclairage du Bassin houiller de Mons.	
Do	Dour	10,422	do	
Do	Flenn	4,501	do	
Do	Frameries	10,592	do	
Do	St. Ghislain	8,419	do	
Do	Hornu	8,532	do	
Do	Jemmapes	11,553	do	
Do	La Bouverie	6,456	do	
Do	Quaregnon	13,256	do	
Do	Wasmuel	2,540	do	
Do	Braine-le-Comte	8,478	Société Anonyme de Braine-le-Comte	
Do	Leuze	6,183	Société Anonyme du Gaz de Leuze	150,000
Do	Quievrain	3,198	Société Anonyme du Gaz de Quievrain	75,000
Do	Charleroi	20,511	The Company General	20,000,000
Do	Chatelet	11,412	do	
Do	Chatelineau	9,589	do	
Do	Couillet	7,801	do	
Do	Dampremy	8,930	do	
Do	Gilly	19,134	do	
Do	Gosselies	8,760	do	
Do	Jumet	23,412	do	
Do	Lodelinsart	7,467	do	
Do	Marchienne-au-Port	14,459	do	
Do	Marcinelle	10,268	do	
Do	Monceau-S-Sambre	7,075	do	
Do	Tournai	34,580	do	
Do	Luttre	1,764	Gas Franco-Belge	1,000,000
Do	Montigny-S-Sambre	14,394	do	
Do	Pont-au-Celles	3,963	do	
Do	Binche	9,657	Binche Gaz Company	
Do	Chimoy	3,118	do	
Do	Enghien	4,269	Enghien Gas Société	
Do	Fontaine-Leveque	5,400	Herman Gaz (private)	
Do	Lessines	8,115	Debilde Gaz (private)	
Do	Mons	25,421	Robert & Co. Gas Company (private)	
Do	Nimy	2,440	do	
Do	Peruwels	8,230	Peruwels Gas Société	
Namur	Dinant	7,140	Société Anonyme des Usines à Gaz réunies.	1,000,000
Do	Namur	28,211	Société anonyme du Gas de Namur	1,700,000

GEORGE W. ROOSEVELT,
Consul.

UNITED STATES CONSULATE,
Brussels, Belgium, May 1, 1890.

DENMARK.

REPORT PREPARED BY THE DIRECTOR OF THE GAS COMPANY OF COPENHAGEN FOR AND TRANSMITTED BY CONSUL RYDER.

INTRODUCTORY STATEMENT.

Denmark was rather late with regard to lighting by gas. While England and France, as early as in the beginning of this century, were in possession of gas works, it was as late as 1853–'54 before the first gas works were started in this country. As in most other countries, it was an English company of engineers who erected gas works here. The company was called the Danish Gas Company, and erected in 1853–'54, seven gas works, viz, Odense, Aarhüs, Elsinore, Aalborg, Viborg, Randers, and

Flensborg. In the year 1860 this company erected a gas works in Frederiksberg, the chief suburb of Copenhagen. With the exception of the Aarhŭs gas works, which in 1879 were transferred to the corporation, the Danish Gas Company is still in possession of the gas works in the other six towns above mentioned. All the works belonging to the company, with only one exception, have been executed simultaneously, and as far as private gas industry is concerned, this is the whole extent of it in Denmark. Nearly all the rest of gas works in this country have been erected by the respective corporations. The main reason for this may be found in the following fact. The city of Copenhagen in 1857 erected its own gas works, and the speculation proving highly advantageous, other towns no doubt were influenced by this experience. It is only fair here to mention that Nyborg, Slagelse and Svendborg had erected gas works on their own account previously. Copenhagen is the only capital in Europe which has erected and works its own gas works, and there are as yet only very few other capitals owning their gas works.

In London, Paris, Berlin, Munich, Vienna, Amsterdam, Brussels, Petersburg, Stockholm, and Christiania, the gas works have been erected by private companies, but only Berlin and Stockholm at the present moment are in working possession of their gas works. The same may be said to be the case with most cities and towns, large or small, on the continent, although great efforts have frequently been made by the respective corporations to obtain possession of the gas works, partly on account of the high interest on the capital invested and partly because of the importance of the possession of such works themselves. The reason why so very few cities, in spite of all efforts, have succeeded in becoming owners of their gas works may most likely be because nearly all contracts contain a clause, according to which the right of supplying the town with gas is unlimited with regard to time, while the sole right for doing so is limited to twenty-five or thirty years. The corporations have therefore as a rule had no means in their power to force a sale after the lapse of the monopoly and have not ventured to erect gas works to compete with those of the companies' works. To purchase the works at the prices generally demanded by the companies has nearly always been out of question. In late years fear of electric lighting has also kept many communities from risking their capitals in the erection of gas works. In Denmark are altogether thirty-six gas works. One belongs to a private consortium, eight are owned by the Danish Gas Company, and twenty-seven are in possession of corporations. This makes 75 per cent belonging to corporations and 25 per cent to private concerns; while in Great Britain 27 per cent are owned by corporations. In Germany about 50 per cent and on the rest of the continent only a very small percentage of the gas works are owned by the respective cities or towns.

Denmark forms, therefore, an exception to the rule, and the gas industry has also developed somewhat differently in this country to other countries, and, in many instances more to its advantage. I may here only

mention briefly the extensive use of cooking gas, a system which only recently has been introduced in other countries, and also the excellent public lighting of the streets and public places, which compares very favorably with the lighting found on the continent generally.

GAS PRODUCTION.

In the year 1886 Danish gas works manufactured 980,631,720 cubic feet of gas. Out of this amount Copenhagen produced 594,517,000 cubic feet, or about 60 per cent of the whole kingdom's gas, and one and one-half times more than all the other gas works in Denmark together. If the suburb of Frederiksberg be counted as part of the capital, Copenhagen consumes more than twice as much gas as the rest of the country. This proportion between the consumption of gas in the capital and that in the country or provincial towns, is, of course, in the main due to the greater number of inhabitants, and although the excess is rarely as large in other capitals, the difference is generally very large. Paris consumes more gas than the rest of France, but London only about one-fourth of the gas consumed in Great Britain, and Berlin about one-fifth of that produced in Germany. The gas produced in London alone is 23,000 millions cubic feet, or one and one-quarter times as large as the gas produced in all France, one and one-half times that of Germany, and twenty-four times larger than the gas supply of all Denmark. The lost gas (unaccounted-for gas) from London gas works only is as much as the whole amount of gas produced in Denmark. Of gas manufactured in Denmark, 83.8 per cent is produced by municipal gas works and only 16.2 per cent from private works. A steady increase has taken place during the last years. In 1881 the production was 705,731,600 cubic feet, and the increase has therefore been 38.9 per cent. The increase in the gas production at the Copenhagen gas works was during the same period, 1881–1886, 27 per cent, or about 4½ per cent a year. The other municipal gas works had at the same time an increase of 63 per cent, while private works had about 60 per cent, equal to a yearly increase of about 10 to 12 per cent. It ought here to be remarked that since 1881 four new corporative gas works had been erected, and if these are deducted the increase for the rest would only be 50 per cent, or about 8½ per cent a year for the above-mentioned years. In the provincial towns the increase has been greatest, and chiefly in towns where the Danish Gas Company has gas works.

This fact is mainly due to a reduction in the price of gas for heating and cooking, a system adopted by the Danish Gas Company in 1882–'83, and it caused a very considerable increase in the consumption of gas during the next years. In most municipal gas works in Denmark this reduction had already taken place at an earlier period.

The following shows the consumption of gas per head in 1881 and 1886:

	1881.	1886.
	Cubic feet.	*Cubic feet.*
In all towns and cities with municipal works	1,651	1,863
In all towns except Copenhagen	1,038	1,447
In towns with private works	1,029	1,360
In Copenhagen	1,988	2,093
Consumption of gas per head throughout in Denmark	.....	490

This shows that consumption of gas grew most in towns which own their gas works, and that individual consumption is greater there than in towns where private companies own gas works, and this in spite of the fact that the latter are in possession of the greater gas works, viz, Frederiksberg, Odense, Aalborg, Elsinore, and Randers, and contrary to the rule that consumption of gas is generally larger in the greater towns. The greatest yearly consumption of gas per head is found in the small town of Nakskow, where it reaches 4,400 cubic feet. The other provincial towns have a consumption of 1,000 to 2,000 cubic feet per head, and such small towns as Maribo with 2,000 cubic feet, Stege with 1,890 cubic feet, Saxkjobing with 1,500 cubic feet gain in comparison in this respect with larger towns, as Aarhus, Horsens, and Svendborg, where consumption per head only reaches 1,420 cubic feet, 1,460 cubic feet, and 1,310 cubic feet, respectively. The existence of large factories in immediate vicinity assists, of course, to a very great degree small townships, and the sugar mills at Stege, Assens, and Nakskov no doubt most materially aid the consumption, but on the other hand such large establishments are rarely found in smaller townships.

The increase in consumption of gas for 1881–1886 is far from constant in the different places. In Assens the erection of a great sugar manufactory caused an increase of 262 per cent. In Ringsted there was an increase of 136 per cent; Nakskov, Veile, and Nykjobing on Falster came then with 87 per cent, and then nine more towns with 50 per cent increase for the same period. The rest of the gas works have had an increase of less than 50 per cent, and Copenhagen has only in those years had an increase of 27 per cent.

As a proof of how the gas industry has grown since the erection of gas works, I may here only mention that gas production in that time multiplied seven and one half-times in Copenhagen, eight times in Nakskov, seven and one-half times in Svendborg, and two to four times in the other towns. With regard to private gas works no exact calculation can be made, because no statement of amount produced during the first year is to be obtained. The first erected gas works have had the greatest increase in their production, having been worked the longest as well as other reasons. When gas works were started in this country very little gas was being used by private people, and 400 to 500 cubic feet per head was counted a very fair consumption, but now

the gas works are started on a calculation of 1,000 to 1,200 cubic feet per head yearly consumption. The greater general knowledge of the utilization of gas, as well as the wearing off of the timidity with which the new light was at first received, has, as a matter of course, had a great deal to do with this fact, but the extensive use of cooking gas may still be looked upon as the most important factor in obtaining the above result. At one of the last erected gas works, viz, Nykjobing on Mors, there was sold during the first year more than twice as much gas for cooking as for lighting purposes. When we compare the yearly production of gas per head in Denmark with that of foreign places the Danish towns stand very high, though in the large cities of the Continent consumption of gas per head is far greater. Birmingham has a consumption per head of 7,366 cubic feet a year; London, 5,938; Paris, 4,519; Vienna, 3,841; Berlin, 2,805.

The small Danish town of Nakskov with 4,400 cubic feet takes, therefore, a very prominent place, especially considering the size. As far as I have ascertained there is no town of equal size in Europe showing an equal consumption of gas. In Germany the greater cities show a consumption per head of 1,050 to 2,800 cubic feet; the medium-sized towns of 350 to 1,050 cubic feet, and the small townships 175 cubic feet, and it is only exceptional when towns with less than 4,000 inhabitants possess gas works. If all inhabitants of the country are included the consumption of cubic feet of gas per head will be: England, 2,200; Scotland, 1,900; Denmark, 490; France, 450; United States of America, 362; Germany, 340. With the exception of Great Britain, Denmark stands, therefore, very fairly compared to other countries.

PRICE OF GAS.

The price of gas has changed very considerably lately, or since the first start. While the price at first as a rule was about 7 shillings and 6 pence per 1,000 cubic feet, it is now rarely more than 5 shillings and 6 pence, and in most places even less, and in most Danish towns there is a still lower price for gas used solely for cooking and for gas engines. This is the case in twenty-seven out of the thirty-six Danish gas works, and, with the exception of two, all gas works have reduced the price for gas used for gas engines. The price is generally the same as that for cooking gas, but in some places even a little less. In the town of Holbæk all gas used during the summer (4 months) is cheaper than gas used during the 8 winter months.

Price of gas in 1886 per 1,000 cubic feet.

LIGHTING GAS.

Towns.	Danish.	English.	Towns.	Danish.	English.
	Kroner.	*s. d.*		*Kroner.*	*s. d.*
1	6.00	6 8	1	4.00	*4 5½
12	5.00	5 6½		3.50	†3 11
10	4.50	5 0	3	3.50	3 11
7	4.00	4 5½	1	3.00	3 4
1	3.54	3 11½			

COOKING GAS.

3	4.50	5 0	1	3.54	3 11½
3	4.00	4 5½	15	3.50	3 11
1	4.00	*4 5½	13	3.00	3 4
	3.50	†3 11			

GAS ENGINES.

2	4.50	5 0	11	3.50	3 11
4	4.00	4 5½	15	3.00	3 4
1	4.00	*4 5½	1	2.62½	2 11
	3.50	†3 11	1	2.50	2 9
1	3.54	3 11½			

* Eight months. † Four months.

In addition to the price for gas should be counted the yearly hire of meter, which is charged in all towns with the exception of Copenhagen. This annual payment varies from 3 to 4 kroner, equal to 3 shillings 4 pence to 4 shillings 5½ pence, and is of no great consequence to large consumers, but small consumers certainly must feel it as a very considerable addition to their gas bills.

For the sake of a comparison with the foreign gas, prices are the following: Great Britain, 2 to 4 kroner per 1,000 cubic feet; Germany, 4 to 5 kroner; France, 5 to 6 kroner. Two prices for gas have not been known in other countries till recently, but a reduction is frequently made after a fixed scale to large consumers, a proceeding rarely adopted in this country. In late years gas works in Germany have adopted the system in vogue in Denmark of making a reduction on the price of cooking gas; but this will be mentioned hereafter. Gas bills are presented to consumers every quarter by the eight gas works owned by the Danish Gas Company and by seven municipal gas works, amongst which is that of Copenhagen. In two places bills are made out every two months and from one gas work every sixth week, while one town has adopted the plan of presenting its bills every second month during winter and quarterly during the six summer months. In three towns bills are paid monthly during winter and every quarter during summer, and in fourteen towns monthly bills is the rule the whole year through, a plan adopted by all gas works erected during the last years. Only in Copenhagen and a couple of other cities a guaranty is demanded

from the consumers. It is evident that all the gas works are inclined to make payment as easy as possible to their customers, but also that the frequent presentation of bills and the consequential addition of trouble and expense has not been overlooked. Still there can be no doubt that a frequent bill presentation causes an increase in consumption amongst small consumers. In Hamburg and other large cities on the continent payment is demanded every month, and in cases of very large consumers even every week. In Paris monthly payment is the rule, but in most other places quarterly bills are generally adopted.

GAS ENGINES.

The number of gas engines in Denmark in 1886 were: In Copenhagen, 151, with 440 horse power, using 15,449,400 cubic feet; other municipal gas works, 76, with 185 horse power, using 5,756,700 cubic feet; private gas works, 41, with 101 horse power, using 4,990,000 cubic feet; making a total of 268, with 726 horse power, using 26,196,100 cubic feet; average horse power per engine 2¾ and consumption about 36,000 cubic feet per horse power. Copenhagen has about 60 per cent and of greater size and horse power than the rest of the country. Seven towns with gas works have no gas engines.

PUBLIC LIGHTS.

Public lighting consumed in 1886 in towns with municipal works 82,600,000 cubic feet; in towns with private works, 15,400,000 cubic feet; together, 98,000,000 cubic feet. Copenhagen alone used for public lighting 54,000,000 cubic feet, or 55 per cent of the whole consumption for public lighting in Denmark.

The consumption per head per annum was, for towns with municipal gas works, 190 cubic feet; for towns with private gas works, 124; for all towns, 175.

The annual consumption for public lighting was at none of the private gas works above 150 cubic feet, while some municipal gas works supplied as much as 300 cubic feet per head. The reason is easily discovered. Corporations not owning their gas works are obliged to pay for public lighting, while municipal works have so much surplus that they are not forced to be so very economical. In twenty-seven towns with municipal gas works were, in 1886, 6,832 lamps. The majority of this belongs to Copenhagen or about 1 lamp to 64 inhabitants.

In the years 1881–1886, London had 1 lamp to 61 inhabitants, Paris had 1 lamp to 50 inhabitants, Berlin 1 lamp to 94 inhabitants, Brussels had 1 lamp to 90 inhabitants, Cologne had 1 lamp to 58 inhabitants, Dresden had 1 lamp to 43 inhabitants, and Hamburg had 1 lamp to 19 inhabitants.

It will not be possible to draw any reliable conclusion as to public lighting from the above, nor can any comparison be made, because of the density of population not being known. According to these figures

London ought to be better lighted than it really is, but the enormous extent of the metropolis easily accounts for this. A better result may be obtained by counting the lamps per running mile of main piping. Hamburg has about 90 lamps per mile; Paris and Copenhagen 44 lamps per mile; London, 23 and the Danish provincial towns 15 to 30 lamps per mile.

LOST GAS.

The real loss of gas is always less than the calculated loss, which latter is obtained from the different readings at the chief register or meter at the gas works and sums of the readings at the meters in town, the difference being due to want of good workmanship in the small meters as well as to the difference in temperature of the gas at the works and of that in town, to condensation in the pipes, and to accidental loss calculated beforehand, considerable errors easily occurring, particularly where no meters have been used to regulate the supply. The amount of lost gas may therefore sometimes be calculated to more than twice of what it really is. The unaccounted for gas for Denmark was in 1886, according to reports, 98,000,000 cubic feet, or about 10 per cent of the whole of the production and equal to the amount used for public lighting. The amount of lost gas was 25 per cent, while some others had as little as 5 to 7 per cent, and one even 1 to 2 per cent, but this latter evidently has committed a mistake by wrong calculation of the lamp supply, which in that same town is out of proportion large. The lost gas at Copenhagen gas works amounts to close upon 60,000,000 cubic feet, or nearly sufficient for the supply of Fredericksburg.

MATERIAL.

The material used in the manufacture of gas is coke, coal, coal tar, etc. The coal consumed by Danish gasworks amounted in 1886 to 98,271 tons, with a gas production of somewhat over 10,000 cubic feet per ton; which must be considered a very fair result, but mostly owing to Copenhagen gas works. If these be excluded, the result is only 9,650 cubic feet per ton. As a rule, the best results are obtained from the larger gas works, on account of better coal being used; still, there is in Denmark a small gas works where 10,900 cubic feet to each ton of coal has been obtained, but this may be looked upon as rather exceptional. In 1886 there were produced 604,778 bags of coke for sale, coke used at the works being of course excepted; but this statement may be somewhat misleading, because many gas works sell their coke crushed, while others do not crush. If the above statement be adopted the result is 6.15 bags of coke per ton of coal.

Copenhagen gas works and those held by the Danish gas company being excluded, the result is 4.68 bays to each ton of coal. The price obtained for above amount of coke was about £55,000, and 98,271 tons of coal, costing in Denmark about £71,000. Nearly 77 per cent of the

price on coal consumed has been covered by sale of coke alone. In London coke only covers 50 per cent, and the Danish result may therefore be looked upon as highly satisfactory. Tar produced in Denmark in 1886 amounted to about 3,696,000 quarts, or 37.6 quarts to each ton of coal. This tar had a value of £6,000, or covered about 8 per cent of the price of coal consumed. Ammoniacal water was utilized only at Copenhagen gas works, and produced here 860,000 cubic feet of sulphate of ammonia annually. The director has now commenced another use of this by-product, letting the ammonia be absorbed by powdered peat, thereby obtaining a most effective manure for agricultural purposes.

Capital invested.—The aggregated value of Danish gas works was in 1886 £818,500, or 16 shillings 6 pence on annual production of each 1,000 cubic feet, and 28 shillings per head of inhabitants of towns with gas works.

COOKING GAS.

It is very difficult to ascertain the exact amount of cooking gas used, only those gas works recording where a special price is fixed for this accommodation, special meters, of course, being used. As, before mentioned, special price for cooking gas is charged by eighteen municipal and nine private gas works.

In 1886 the twenty-seven gas works mentioned reported the following consumption:

Description.	Lighting gas.	Cooking gas.
	Cubic feet.	*Cubic feet.*
18 municipal gas works	61, 082, 000	23, 838, 000
9 private gas works	98, 812, 000	33, 338, 000
Total	159, 894, 000	57, 176, 000

It may be noted that only the small gas works among the corporative works have adopted special price for cooking gas. Cooking gas amounted at all twenty-seven gas works to about 27 per cent of all gas sold and passed through meters, this percentage being the same for municipal and private gas works.

About 100,000,000 cubic feet of cooking gas is sold annually, equal to 10 per cent of the whole gas production. The price for cooking gas from twenty-seven gas works, who charge reduced prices for this commodity, are: Two gas works, 4.50 kroner (5 shillings) per 1,000 cubic feet; one, 4.00 kroner (4 shillings 5½ pence); twelve, 3.50 kroner (3 shillings 11 pence), and twelve, 3.00 kroner (3 shillings 4 pence).

With the exception of the three first (Frederiksberg, with 4.50, being one of them) 3 to 3.50 Kroner is about the general price demanded for cooking gas, but there is a general inclination toward lower prices throughout, and these will no doubt soon be ruling. On the continent lower prices—like 3 shillings 6 pence to 4 shillings—are almost universal where separate prices are charged, and particularly in Germany this

system has lately been adopted, mostly by larger gas works, while in Denmark the smaller works have commenced to do so. Berlin charges 3 shillings 8 pence; Cologne, 3 shillings 5 pence; Stettin, 4 shillings; Dresden, 3 shillings 4 pence, per 1,000 cubic feet of cooking gas.

Osnabrück was perhaps the first town where the system was introduced, and with highly satisfactory result. In Great Britain and France the system has not gained footing as yet, but at Brussels and a few places in Holland separate prices are charged for gas supplied during day and night, the day gas being considerably cheaper; meters being, of course, especially constructed for this purpose. Without entering upon an argument on the advantages or disadvantages of the cooking-gas system, I will here show its development in some of the places.

Nakškov commenced as early as 1863 to charge a lower price for cooking gas. The general price per 1,000 cubic feet was then 7 shillings 3½ pence, and the production 3,500,000 cubic feet (now it is 24,000,000).

To induce people to use more gas, the price for cooking and heating was lowered to 3 shillings 8 pence, a smaller reduction not being deemed sufficient inducement, and consumption increased immediately and has continued to increase ever since. From 1865 to 1881 consumption rose from 1,315,000 to 5,315,000 cubic feet, or nearly four times, and in 1880 already there was sold as much cooking as lighting gas. This result caused some commotion in the gas world, and several gas works immediately adopted the system, now general in Denmark.

The exceptionally favorable result of Nakškov gas works since 1863 was caused no doubt by the introduction of cooking gas, although, the general working of the establishment being very good, it apparently is no better than most Danish gas works.

The Danish gas company in 1870 commenced the system, and though the price for cooking gas was pretty high (5 shillings), the consumption of cooking gas increased considerably. At Frederiksberg the increase was 100 per cent during the first couple of years, and it has continued to increase ever since. In 1868 about 119,000 cubic feet of cooking gas were sold, and in 1878 about 7,600,000 cubic feet, and in 1886 11,600,000 cubic feet. In most towns where the Danish gas company owns the gas works great reductions for cooking gas were made in 1882–'83, prices being lowered to 3 shillings 4 pence and 3 shillings 10 pence, and consumption in consequence increased rapidly. In Aalborg the consumption grew with 270 per cent in the first year and with 152 per cent the second year; in Veile, 92 and 30 per cent; in Elsinore, 94.7 and 78.3 per cent; Randers, 75.4, 76.2, and 60.7 per cent; Odense, 16.3, 24.4, and 30.4, and in Viborg 97.4, 66.9, and 42.8 per cent.

Gas production of Nakskov from 1863 to 1887.

Year.	Production.	Sold.		Proportion of cooking to lighting.	Price for gas.		Increase in consumption.		Number of consumers.		
		Lighting.	Cooking.		Lighting.	Cooking.	Lighting.	Cooking.	Lighting.	Cooking.	Lighting and cooking.
	Cubic feet.	*Cubic feet.*	*Cubic feet.*	*Per ct.*	*s. d.*	*s. d.*	*Per ct.*	*Per ct.*			
1863	3,523,400	1,925,200	395,800	.....	7 4	3 8½	11	.....	138	6	49
1864	3,964,500	1,735,600	966,600	55	7 4	3 8½	9¾	1.44	120	18	66
1865	4,311,100	1,854,100	1,315,900	71	6 6	3 8½	6½	36.1	113	23	73
1866	4,784,200	2,073,400	1,687,900	81	6 0	3 8½	11.8	28.2	121	60	90
1867	5,553,000	2,474,400	1,993,000	80	6 0 / 4 7	3 8½	19.4	18.1	126	62	92
1868	6,550,000	3,061,600	2,262,500	70.5	4 7	3 8½	23.7	13.5	131	74	92
1869	6,648,000	2,988,000	2,258,500	75	4 7	3 8½	2.4	0.2	126	76	96
1870	6,435,000	2,995,800	2,184,400	72	4 7	3 8½	0.2	3.3	127	83	95
1871	6,935,000	3,218,800	2,419,200	75	4 7	3 8½	7.5	10.7	125	87	103
1872	7,057,000	3,370,000	2,531,500	75	4 7	3 8½ / 4 1½	4.7	4.6	123	88	106
1873	7,659,000	3,751,000	2,628,000	70	4 7 / 5 ⅛	4 1½	11	3.8	117	88	106
1874	9,177,000	4,308,100	2,894,900	67	5 ⅛ / 4 7	4 1½ / 3 8½	15.1	10.1	135	99	112
1875	10,446,000	4,771,900	3,328,800	69	4 5½	3 4	10.1	15	126	118	125
1876	11,673,400	5,047,600	3,946,000	78	4 5½	3 4	5.8	18.5	128	124	140
1877	11,947,000	4,983,400	4,190,600	83	4 5½	3 4	1.25	6	120	137	143
1878	12,296,900	5,097,200	4,717,200	92	4 5½	3 4	2.25	12.5	107	156	154
1879	12,478,600	5,011,500	4,918,100	98	4 5½	3 4	1.7	4.2	105	184	156
1880	12,850,300	4,981,800	5,180,500	104	4 5½	3 4	0.6	5.3	106	208	145
1881	12,633,200	4,923,300	5,315,300	107	4 5½	3 4	1.1	2.6	95	221	155
1882	16,138,000	8,712,000	*3,812,000	.....	4 5½ / 3 4	.....	.....	.....	489		.....
1883	18,625,000	14,190,000		.....	3s. 4d.		.....	.....	514		.....
1884	21,218,000	15,960,000		.....	3s. 4d.		.....	.....	566		.....
1885	23,101,100	17,140,800		.....	3s. 4d.		.....	.....	588		.....
1886	23,623,800	17,140,800		.....	3s. 4d.		.....	.....	592		.....
1887	24,338,600	16,517,100		.....	3s. 4d.		.....	.....	607		.....

* Nine months, the balance for eight months.

Consumption of cooking gas.

Cities.	1881.	1886.	Increase.
	Cubic feet.	*Cubic feet.*	*Per cent.*
Aalborg	286,000	3,700,000	13.3
Veile	503,000	1,353,000	2.7
Elsinore	711,006	2,195,000	3.1
Randers	590,000	2,900,000	4.9
Odense	3,486,000	6,500,000	1.9
Viborg	790,000	3,600,000	4.6
Total	6,366,000	20,248,000	3.18

The above shows an increase in the use of cooking gas in towns where reduction took place in the years 1881–'83, a considerable increase being the result. It ought here to be mentioned that a reduction in the price for laying the piping was made at the time, and an exhibition of novel gas cooking appliances, together with a distribution of pamphlets treating on the matter, and may to a very large degree have produced the result. Cooking gas consumption may vary greatly at the different gas works, even at the same prices, and is evidently to a great extent dependent on the energy displayed by the local gas works. As an example may be mentioned here the small township of Nykjöbing-on Mors, where gas works were erected in 1886, the consumption of

cooking gas in 1887 being, 1,589,000 cubic feet and 664,000 cubic feet for lighting purposes. In one single summer month there was sold twenty-five times as much cooking gas as lighting gas. Still this is exceptional, and only one town, Maribo, sells annually twice as much cooking gas as gas for lighting. An example of the steady increasing consumption of cooking gas, while gas for lighting has remained nearly constant, will be found in the following table showing the consumption of cooking gas in Thisted:

Month.	1883.	1884.	1885.	1886.	1887.	1888.
January	.....	41,900	70,400	94,600	118,000	148,100
February	.....	37,000	55,800	87,100	97,000	124,500
March	.....	40,500	62,500	80,800	100,700	122,900
April	.....	42,600	57,100	95,200	107,200	.....
May	.....	45,300	76,200	106,400	126,300	.....
June	.....	50,100	84,600	104,600	116,100	.....
July	.....	54,800	71,400	105,800	117,800	.....
August	.....	62,500	86,900	117,900	129,500	.....
September	.....	62,200	86,800	113,900	127,400	.....
October	.....	61,100	93,700	121,600	146,900	.....
November	.....	64,700	98,300	111,300	130,900	.....
December	40,600	73,600	100,900	115,200	144,200	.....
Total	.....	636,300	944,600	1,254,400	1,462,000	.....

During these same years consumption of gas for lighting was: 1884, 1,986,320 cubic feet; 1885, 1,995,650 cubic feet; 1886, 1,933,250 cubic feet, and in 1887, 1,954,550 cubic feet.

The foregoing table shows the consumption of cooking and lighting gas for the year 1887, being the first working year. The prices were 3 shillings 10¾ pence per 1,000 cubic feet cooking gas and 5 shilling 6½ pence per 1,000 cubic feet lighting gas. The town is Nykjöbing on Mors. From these examples it is evident that cooking gas is still very considerably on the increase. The whole production of gas was in 1887 3,372,940 cubic feet.

The municipal water works are being worked by gas engines, and this may account for the fact that 60 per cent of the whole production is consumed as cooking gas and for gas engines, a proportion not found either in Denmark or any other country.

Gas works in Nykjöbing on Mors.

Date.	Lighting gas.	Cooking gas.	Date.	Lighting gas.	Cooking gas.
1887.			1887.		
January	91,100	74,000	November	104,900	140,2
February	69,900	66,800	December	127,400	148,1
March	51,500	76,900			
April	33,600	99,100	Total	664,900	1,589,0
May	14,300	140,500			
June	6,100	155,900	1888.		
July	8,300	155,700	January	107,600	124,[illegible]
August	19,900	183,100	February	84,600	110,[illegible]
September	50,800	190,700	March	45,600	113,[illegible]
October	87,100	158,000	April	33,800	126,[illegible]

This of course has great influence on the general management of the gas works as winter and summer productions thereby became more equalized, and small gas works may thus be enabled to produce a great amount of gas annually. While maximum production, as a rule, is five to seven times larger than minimum production in Denmark, as well as other countries, at Nykjöbing it was only as two to one.

Maximum production being a ruling factor at erection of gas works, it will easily be granted how very important the cooking-gas system is becoming.

From the above tables it will be seen that the consumption of cooking gas is larger during the summer months, many families using no cooking gas during winter, not being able to do without any fire in their kitchen and many people heating water for domestic purposes on the stoves. The consumption of cooking gas being still increasing in the four months of 1888, as seen above, it will be interesting to follow the further development of it.

English coal from Newcastle or Sunderland is nearly exclusively used on all Danish gas works. German coals from Westphalia have been tried, but besides being more expensive they do not produce cokes so well as English coals, a most important consideration in a country where so many cokes are used by private people. Some Australian shale is also being used for enhancing the illuminating power, but this is also very expensive, costing 95 kroner per ton. They resemble Scotch boghead (torbane mineral), but possess more illuminating qualities and are easier to work.

The method for finding the value of coal for gas production consists partly therein by trying to find how much crude oil can be obtained from them by a fixed, low temperature. From Newcastle coal is obtained 6 to 9 per cent crude oil, and from the now exhausted Scotch boghead 40 to 50 per cent, while Australian shale yields 50 per cent. Attention has been drawn to American kerosene and to Russian masuth; but high duty prevents their use, and thus the American process by Strong & Love becomes too expensive. But the rising price of English coal may yet force us to employ that excellent process mentioned, or to invent new ways and means. There have been made a number of experiments with a view of enhancing the illuminating power of gas produced from coal from Newcastle, the so-called common gas (13 to 14 candle), by using kerosene, but this, demanding high temperature for turning into gas and not being absorbed by coal, the desired end has not as yet been obtained; also experiments to make peat absorb kerosene (they absorb twice their own weight), and obtained a very fine result as the illuminating power of the kerosene, which was even stronger than when obtained by Strong & Love's process, at least as far as we have been able to ascertain. But in Denmark these methods will not pay; peat is too expensive in the towns and kerosene cost 100 kroner per ton. A new process has lately been invented by Mr. Brin of

England. That gentleman, in a very clever way, prepares oxygen from hyperoxide of manganese through great heat, by which the oxygen is liberated, while again the oxygen of the atmosphere by lowering the temperature replenishes the lost oxygen by exposure. Mr. Brin proposes to clean the gas of sulphur by aid of oxygen, a method long known, but has also found that by adding oxygen to kerosene gas the illuminating power is considerably enhanced, all the illuminating compounds contained in kerosene gas thereby being more utilized; 100 pounds English kerosene produce 1,000 cubic feet gas, corresponding to a value in illuminating power of about 4,000 cubic feet of common gas (13 to 14 candles), at 5 cubic feet per hour with suitable burners. By adding oxygen to 1,000 cubic feet of kerosene gas, Mr. Brin obtains a light equal to 11,000 cubic feet common gas. This invention may be of the utmost importance, but it will mainly depend on two circumstances, which first must be examined most minutely, viz: if the two kinds of gas will remain mixed for any length of time while in the gasometers, and, if there is no danger of explosion. Experiments on a large scale must be made before these questions can be satisfactorily answered.

METHOD OF MANUFACTURE.

In Denmark we are therefore dependent on English coal from the basin of the Tyne, and for many years the price has been 7 to 8 shillings per ton free on board, freight to Denmark varying from 4 to 8 to 10 shillings per ton. Duty about 0.5 krona per ton. At this present moment coal has risen to 12 to 14 shillings free on board and the consequences as well as the future is difficult to predict.

In Denmark only clay retorts are used, and these are made cheapest and best in Germany. Number of retorts in each oven from 3 to 9, the last number only used in Copenhagen gas works recuperating ovens. Ovens have here been brought to a great state of perfection, only 12 pounds of coke being used to produce gas from 100 pounds coal. Wear and tear on retorts is very small, only 0.07 krona per 1,000 cubic feet while it is reported to be three times as large in Great Britain. This may be caused by better fireproof materials being found in Germany. Sweden and part of Denmark, where large deposits of china clay, while English fire clay is of an inferior quality, containing scarcely 30 per cent oxide of alum. Stettiner-Chamotten-Fabrik (former Didier) as well as Höganäs in Sweden are the chief factories; prices of retorts varying from 60 to 90 kroner apiece and of firebricks from 240 to 60 kroner per 1,000 according to quality. The results obtained from these retorts is very variable, depending on the size and on the employment of exhaustors to draw the gas. Highest amount of gas produced from one retort 9 feet long was 7,400 cubic feet in 24 hours and 10,800 cubic feet from 1 ton of coal. Körtings steam jet exhaustor (Hannover) and Bryan. Donkins exhaustor (London) is employed. Lime is sometimes, though rarely used to purify *gas, while* oxide of iron, commonly found in ours moves in chemical com-

bination with water, is more generally used as purifying material. I may here remark that in Copenhagen we have for a long while used small additions of atmospheric air, but that this most likely now will be substituted by oxygen. Oxide of iron purifies gas entirely of sulphureted hydrogen, but not of carbonic acid, as only 1–1½ per cent of the latter is found in English coal gas, this does not much matter in regard to illuminating power. Carbonic acid is absorbed by lime, which has a deteriorating effect on the illuminating power, so that when no more than 1-1½ per cent of carbonic acid is present, the advantage and disadvantage in using lime are about equalized. Some time since it was proposed to use Hills method, viz, heating the gas water to purify it of some of the carbonic acid and sulphureted hydrogen, and then let the gas pass through, but experiments in this direction have not been successful as yet, although the idea may still be important.

The illuminating power generally obtained in Denmark is about 5 cubic feet, 13 to 14 candles burning 120 grains in the hour, in Copenhagen somewhat larger or about 16 candles after English measure.

WAGES.

Wages are a little lower in provincial towns than in Copenhagen and about 2 kroner for 12 hours work. In Copenhagen retort men get 3 kroner and a bonns (tantiême), amounting sometimes to 12 krona a day. Common labor 2.50 kroner. The men get free of charge, soda water and skibs-ale (thin ale), as well as hot baths when required. They have a right to pension which amounts to two-thirds of their annual wages, when they have been in constant service for twenty-five years.

CONCLUSION.

In attached list of gas towns of Denmark I beg to note that the figures are a couple of years old and that matters of course have progressed since. In Copenhagen price on cooking-gas has been lowered to 3 kroner, considerably increasing consumption, so much so that cooking gas most likely will amount to more than lighting gas soon. Experience shows that families of the middle class use 7 cubic feet cooking gas a day per head.

Coke production is made out in bags of 6 cubic feet, weighing 80 kilograms.

Tar is measured in quarts, 1 liter.

The cubic feet are English measure.

COPENHAGEN, *May* 7, 1890.

Gas statistics for the several towns and cities of Denmark.

Name of town.	Number of inhabitants in 1886.	Year of erection.	Gas produced during the first year.	Gas produced in 1881.	Gas produced in 1886.	Number of retorts.	Gasometers contained.
			Cubic feet.	*Cubic feet.*	*Cubic feet.*		*Cubic feet.*
Copenhagen	285,000	1857	81,903,600	467,176,600	594,517,000	.....	2,700,000
Aarhuus	30,000	1854	.....	26,000,000	42,500,000	81	220,000
Nakskov	5,400	1860	2,857,600	12,633,200	23,623,800	35	85,000
Horsen	13,000	1859	4,266,000	14,539,000	19,001,000	38	70,000
Svendborg	8,000	1856	1,417,900	7,603,900	10,512,001	28	58,000
Roeskilde	6,500	1863	3,048,800	7,982,700	9,409,600	18	34,000
Kolding	10,000	1860	.....	7,083,700	9,407,800	33	28,000
Nyborg	5,700	1855	2,259,300	5,632,800	867,300	25	22,000
Nestved	4,900	1862	.....	7,188,800	8,497,300	16	48,000
Fredericia	9,000	1866	2,491,300	6,451,900	8,177,600	21	27,000
Nykjobing, Falster	5,000	1865	.....	3,008,000	7,308,420	15	24,000
Holbek	3,300	1865	1,942,800	4,784,800	7,223,400	17	20,000
Slagelse	5,500	1855	1,956,700	4,701,800	6,477,700	15	25,000
Ringsted	2,200	1866	1,400,000	2,250,000	5,320,000	8	19,000
Faaborg	3,500	1865	2,500,000	3,821,000	4,927,000	15	20,300
Ribe	4,000	1863	1,815,000	3,520,000	4,925,800	12	30,800
Maribo	2,500	1865	1,305,700	3,764,600	4,918,000	11	10,000
Frederiksborg	3,000	1868	.....	4,000,000	4,850,200	12	21,800
Kjöge	3,200	1867	2,000,000	4,588,000	4,808,000	9	14,000
Silkeborg	4,000	1857	1,728,840	3,281,000	4,222,000	11	25,000
Korsör	4,400	1863	2,334,600	3,148,500	4,176,000	11	.....
Vordingborg	2,700	1866	1,149,900	3,412,200	3,974,500	11	14,000
Varde	4,000	1885	.....	.....	4,043,700	10	14,000
Thisted	4,200	1883	.....	.....	3,829,400	9	15,000
Stege	2,000	1866	1,243,300	1,927,600	3,782,700	9	14,000
Sarkjobing	1,500	1865	700,000	1,463,000	2,369,500	6	11,500
Nykjobing, Mors	2,800	1886	.....	.....	572,000	6	14,000
Holstebro	3,500	1881	.....	2,969,100	2,985,100	9	10,000
Frederiksberg	35,000	1864	.....	38,000,000	60,000,000	.....	.....
Odense	25,000	1854	.....	24,500,000	39,000,000	.....	.....
Elsinore	10,000	1854	.....	6,700,000	11,000,000	.....	.....
Aalborg	16,000	1854	.....	12,200,000	18,500,000	.....	.....
Viborg	8,000	1854	.....	5,400,000	8,800,000	.....	.....
Randers	15,000	1854	.....	9,400,000	14,800,000	.....	.....
Veile	8,000	1854	.....	4,100,000	7,700,000	.....	.....
Assens	3,500	1854	.....	1,600,000	5,800,000	.....	.....

Gas statistics for the several towns and cities of Denmark—Continued.

Name of town.	Consumption, 1886.			Number of consumers.		Price per M cubic feet in crowns.			Public lighting consumed in 1886.
	Lighting.	Cooking.	Engine.	Lighting.	Cooking.	Lighting.	Cooking.	Engine.	
	Cubic feet.	*Cubic feet.*	*Cubic feet.*						*Cubic feet.*
Copenhagen	451,521,200	.....	14,449,400	.....	.....	4.50	4.50	4.00	54,000,000
Aarhuus	.....	.....	700,000	.....	.....	4.00	4.00	4.00	7,660,000
Nakskov	.....	.....	1,831,500	592		3.00	3.00	2.50	1,580,000
Horsen	9,167,500	4,918,100	530,200	489	579	4.50	3.00	3.00	2,873,500
Svendborg	5,938,600	1,368,600	98,600	217	59	4.00	3.00	3.00	1,246,400
Roeskilde	4,930,800	996,600	63,000	205	122	4.50	3.00	3.00	1,436,800
Kolding	5,116,600	2,253,700	169,100	240	142	5.00	3.00	3.00	968,400
Nyborg	5,817,700	1,488,900	.....	197	101	4.50	3.00	3.00	1,100,000
Nestved	.....	.....	1,442,500	233	.....	3.50	3.50	3.00	1,047,800
Fredericia	5,627,800	664,100	290,200	78	6	4.50	3.50	3.50	1,099,240
Nykjobing, Falster	.....	.....	.....	267	.....	3.50	3.50	3.50	1,357,620
Holbek	.....	.....	.....	.....	.....	{*4.00 / †3.50}	.....	.....	840,000
Slagelse	3,057,900	966,000	366,300	89	42	4.00	3.00	3.00	1,173,480
Ringsted	2,004,000	1,400,300	.....	.....	.....	5.00	3.00	3.00	539,000
Faaborg	1,754,710	1,912,300	.....	194	55	4.50	3.00	3.00	349,000
Ribe	.....	.....	.....	.....	.....	3.54	3.54	3.54	632,000
Maribo	1,440,600	2,801,500	.....	120	204	4.50	3.00	3.00	840,000
Frederiksborg	2,059,400	904,900	136,300	61	27	5.00	3.50	3.50	789,000
Kjöge	.....	.....	.....	.....	.....	3.50	3.50	2.62½	786,000
Silkeborg	3,474,500	244,100	.....	130	48	4.00	3.00	3.00	295,000
Korsör	2,451,700	339,800	58,600	67	42	5.00	3.50	3.50	560,140
Vordingborg	2,638,000	756,200	.....	24	51	5.00	3.00	3.00	350,000
Varde	2,508,900	936,100	21,200	137	158	5.00	3.50	3.50	495,600
Thisted	1,843,600	1,255,400	.....	105	145	5.00	3.50	3.50	408,700
Steje	.....	.....	.....	.....	.....	4.00	4.00	4.00	355,000
Saxkjobing	1,040,000	704,800	258,700	.....	.....	5.00	3.50	3.50	221,900
Nykjobing, Mors	165,600	116,400	42,500	60	240	5.00	3.50	3.50	96,870
Holstebro	1,710,000	466,500	.....	.....	.....	5.00	4.00	4.00	290,000
Frederiksberg	37,800,000	11,600,000	1,167,000	.....	.....	5.00	4.50	4.50	4,300,000
Odense	23,300,000	6,500,000	2,400,000	.....	.....	4.00	3.50	3.00	3,700,000
Kjalmore	5,874,000	2,195,000	275,000	.....	.....	5.00	3.50	3.50	1,280,000
Aalborg	10,600,000	3,700,000	202,000	.....	.....	4.00	3.00	.....	2,274,000
Viborg	3,700,000	3,600,000	325,000	.....	.....	4.50	3.50	.....	629,000
Randers	8,300,000	2,900,000	314,000	.....	.....	4.50	3.50	.....	1,780,000
Veile	4,800,000	1,353,000	273,000	.....	.....	4.50	3.50	3.00	583,000
Aasens	2,438,000	490,000	.....	.....	.....	6.00	4.50	.....	392,000

*Eight months. †Four months.

Gas statistics for the several towns and cities of Denmark—Continued.

Name of town.	Unaccounted-for gas, 1886.	Number of gas engines.	Amount of horse power.	Coal consumed.	Surplus of coke.	Tar produced.	Number of public lamps.	Amount of capital invested.
	Cubic feet.			*Tons.*	*Bags.*	*Quarts.*		*Crowns.*
Copenhagen	60,000,000	151	440	58,267	374,257	2,299,579	3,904	9,574,842
Aarhuus	4,887,000	10	17	4,420	23,900	170,520	526	670,000
Nakskov	2,943,200	9	38½	2,117	11,919	84,000	134	185,000
Horsen	1,378,600	6	13	2,273	9,800	78,300	268	310,000
Svendborg	1,534,800	4	5½	1,098	4,162	34,800	160	186,000
Roeskilde	94,000	1	1	1,100	3,496	27,480	104	83,203
Kolding	900,000	7	12½	964	3,737	28,860	136	100,000
Nyborg	1,366,400	.....	.....	972	4,808	29,880	102	144,000
Nestved	830,000	4	4½	809	4,315	25,200	103	93,570
Fredericia	496,058	3	14	820	3,227	23,400	93	131,000
Nykjobing, Falster	185,000	4	6	742	5,000	21,600	119	99,000
Holbek	1,120,000	2	0½	595	4,324	22,320	70	106,000
Slagelse	600,000	7	15	683	2,400	23,400	148	130,000
Ringsted	1,376,700	.....	.....	500	1,475	18,000	68	76,000
Faaborg	862,790	2	4	392	1,732	13,440	65	35,946
Ribe	.....	.....	.....	495	2,450	13,800	97	114,000
Maribo	335,900	3	1½	757	2,700	20,400	76	74,000
Frederiksborg	960,600	4	11	477	1,898	12,000	84	86,539
Kjöge	624,000	2	6	483	2,300	15,120	72	68,000
Silkeborg	503,300	.....	.....	424	1,600	12,000	52	65,000
Korsör	765,760	1	2	522	1,439	9,900	90	38,000
Vordingborg	414,300	.....	.....	496	2,127	13,300	44	62,400
Varde	387,000	1	2	435	2,350	12,000	88	86,460
Thisted	261,400	2	4	395	1,735	10,000	84	107,500
Stege	492,000	.....	.....	440	1,398	9,600	52	76,564
Saxkjobing	103,600	1	8	335	1,610	13,300	34	61,500
Nykjobing, Mors	61,240	2	8	56	162	1,000	59	60,000
Holstebro	500,000	1	1	344	1,057	9,000	50	54,754
Frederiksberg	5,000,000	.....	.....	6,000	60,000	240,000	.....	2,000,000
Odense	3,000,000	.....	.....	4,000	34,000	150,000	.....	
Elsinore	1,000,000	40	100	1,100	6,000	40,000	.....	
Aalborg	1,714,000	.....	.....	1,900	11,000	70,000	.....	
Viborg	546,000	.....	.....	900	5,400	35,000	.....	
Randers	1,406,000	.....	.....	1,500	9,000	56,000	.....	
Veile	594,000	.....	.....	800	5,000	30,000	.....	
Assens	480,000	.....	.....	600	3,000	22,000	.....	

FRANCE.

BORDEAUX.

REPORT BY CONSUL KNOWLES.

Cities and populations.—These are Bordeaux, 269,961 inhabitants; Toulouse, 140,000 inhabitants; Pau, 30,000 inhabitants; Montauban, 28,000 inhabitants; Bayonne, 26,000 inhabitants; Tarbes, 23,000 inhabitants; Agen, 20,000 inhabitants; Libourne, 16,736 inhabitants; Arcachon, 7,133 inhabitants; Bazas, 5,114 inhabitants; Langon, 4,740 inhabitants; St. André de Cubzac, 3,543 inhabitants; and Ste. Foy la Grande, 3,466 inhabitants.

Name of gas company.—Regarding these, as well as of other statistics on the subject, I am forced, through the comparative meagerness of my information, to limit myself to only a few of the above-named cities. Bordeaux, Compagnie du Gaz de Bordeaux; Libourne, Compagnie Nouvelle du Gaz; Arcachon, Société Immobilière d'Arcachon; Bazas, Tellier & Co.; Langon, Compagnie Gapiand; St. André de Cubzac, Leroy-Dupré Company; Ste. Foy la Grande, Compagnie Fusion du Gaz.

Amount of money invested.—Again I am able to give but the capital of the companies of Bordeaux and Libourne. The Compagnie du Gaz de Bordeaux is a joint-stock company, founded January 1, 1876, under a charter extending for 28 years, 6 months. It has a capital of 3,000,000 francs, pays an annual dividend of 5 per cent, and its stock is quoted on the Paris bourse at 532 francs a share. The Compagnie Nouvelle du Gaz de Libourne has a capital of 700,000 francs, with obligations limited to 400,000 francs.

Process of manufacture.—The process of manufacture is very simple. The gas is generated within horizontal earthen crucibles. From the crucibles the gas is forced by its own pressure through a tank containing water, which robs it partially of its tar, ammoniacal salts, and other impurities. Thence it is drawn by suction through a number of upright annular tubes, offering a great amount of surface, and where it not only becomes cool, but deposits through obstruction still more of those substances in mechanical suspension with it. Again it is passed over a quantity of coke, and still again over a bed of oxide of iron. For the last time it is forced through water, and it is then ready to be received into the gasometers.

Candle power of gas.—The brilliancy of gas in France is not measured by the standard of candles. The standard in use is a lamp known as a Carcel lamp, consuming 42 grams (about 646 grains) of oil of colza in an hour. Within the period that the lamp consumes the above-mentioned 42 grams, the jet of gas at its side must burn 105 liters (23.10 gallons) of gas. If the jet burns less than this quantity of gas, the superintendent at the works knows that the product is up to or above the standard. If it consumes more, the reverse is the case.

Approximate annual output.—The Compagnie du Gaz de Bordeaux produces annually about 23,500,000 cubic meters of illuminating gas (830,020,000 cubic feet); Libourne, Compagnie Nouvelle du Gaz produces annually 725,000 cubic meters (83,213,920 cubic feet). Production at the other places I am unable to ascertain.

Number of consumers.—Again, as in the answers to the remaining questions, I shall be obliged of necessity to limit my replies alone to Bordeaux and Libourne. The subscribers to the gas company in Bordeaux number 13,600; at Libourne, 800.

Price.—In Bordeaux gas is supplied to the city for lighting the streets, etc., at 33 cents per 1,000 cubic feet and to general subscribers at $1.20 per 1,000 cubic feet. At Libourne it is supplied to the city at 74 cents, and to subscribers at $1.30 per 1,000 cubic feet. At Arcachon the city pays $1.12, and subscribers $2.24 per thousand. In the other cities within the Bordeaux consular district the price of gas usually decreases in inverse proportion to the population.

Gas stoves.—These are very extensively employed, at least for cooking if not for heating. Ordinary stoves are almost unknown in France, and gas, being so much cheaper in proportion than is coal, great quanti-

ties of it are used in the kitchen. The average climate of Bordeaux during the winter is such that dwelling houses do not require the same degree of heating as in more northern cities. Then, again, during the summer so intense is the atmospheric heat that it is a matter of some importance with housekeepers to employ any substitute for wood or coal. Hence the primitive fireplaces which we find even in the most modernly equipped houses have by degrees given way to the more convenient, economical gas stove.

Wages.—In Bordeaux the stokers at the gas works are paid at the rate of 10 cents an hour, or $1.20 for a day's work of 12 hours. At Libourne they are paid 80 cents a day, or 6⅔ cents an hour.

Material used.—English and common French coals, are those in general use, the fluctuations of the market alone influencing the purchase or the employment of either. Its cost at the gas works varies from $5.20 to $5.60 per ton.

Recently the gas companies in this and other cities of France have suffered to a greater or less extent at the introduction of lighting by electricity. The smaller incandescent electric lights are by degrees, though none the less surely, supplanting the gas jet. In the restaurants, cafés, and places of amusement they are used almost exclusively. Exactly how long the companies can withstand this competition it is difficult to conjecture. That it will tend to lower the price of gas is almost certain. That it will eventually supersede it is not altogether probable.

HORACE G. KNOWLES,
Consul.

UNITED STATES CONSULATE,
Bordeaux, July 30, 1890.

CORSICA.

BASTIA.

MR. ANDERSON TO CONSULAR AGENT DAMIANI.

Monsieur DAMIANI,
United States Consular Agent, Bastia:

The gas company of Bastia has no particular name, the works belonging to two London gentlemen.

About £18,000 to £20,000 has been invested in the concern, but the consumption of gas is far from being fully developed.

The gas is made from coal and purified by water and lime.

The power is about 1.40 to 1.50 Carcel lamp as tested under "Paris" conditions.

The annual output is about 150,000 cubic meters and the number of consumers about 250.

The price ranges from 25 centimes for public lighting to 35 centimes for private consumers per cubic meter.

Scarcely any gas stoves in use.

Stokers work two shifts in twenty-four hours.

The material used is Newcastle gas coal.

There is little private house-lighting in Bastia, all the consumption taking place in cafés, shops, and clubs.

Our coal is imported direct from Newcastle, and as there is no return freight, the vessels having to leave the port in ballast, the freight on the coal is consequently very high.

By the terms of the concession the proprietors are entitled to charge 60 centimes per cubic meter, but of late years several reductions in price have been accorded and to large consumers it is 33 centimes net. This compares very favorably with the price at Paris, 30 centimes, and Marseilles, 32 centimes per cubic meter.

D. H. ANDERSON,
Manager.

UNITED STATES CONSULAR AGENCY,
Bastia, April 16, 1890.

HAVRE.

REPORT BY CONSUL WILLIAMS.

In reply to the circular received at this consulate in relation to the manufacture of gas, I have the honor to report that on the north of the Seine several cities are supplied with gas by the European Gas Company, with home office in London. I visited the Havre office of the company, but its agent had been instructed to answer no questions, as per department circular; he however promised to ask the London office for permission to answer. The London Company has, however, refused permission after knowing the exact questions and their source.

OSCAR F. WILLIAMS,
Consul.

UNITED STATES CONSULATE,
Havre, France, June 2, 1890.

LIMOGES.

REPORT BY COMMERCIAL AGENT GRIFFIN.

There has been a very great reticence on the part of the gas companies to give any information. It has been necessary to write and write, and to make personal visits to find out the information desired. There

seems to be a fear that the electric-light companies are seeking to get knowledge to the prejuice of the gas companies, and therefore the manufacturers of the last-named article are very loath to give any information.

Perhaps another fact against giving information is that the gas manufactured in provincial cities of France is so very poor that the companies feel ashamed to have the facts go out before the world, as it would seem to invite rivalry.

Gas is employed chiefly for lighting the streets, stores, and public places; very few use it in their homes, because of the expense and also because the light is often poor and wretched; it is not desirable. There are only a few who employ gas as a means for cooking, and I have not found a single case where it is employed as a motive power to run gas engines. The sole idea of the manufacturer is to produce the gas very cheaply and make as much coke as possible.

Coke finds a ready sale and is extensively used for heating and culinary purposes. The principal variety of coal employed in France is the Commetry, mixed with the North Wales or Newcastle coals of England.

The following shows the questions and corresponding answers. The cities herein named are the only ones from which information can be obtained:

Name, location, and population of cities using gas: Limoges, Haute-Vienne; population, 70,000. Poitiers, Vienne; population, 36,878. Châteauroux, Indre; population, 22,860. Brive Corrèze; population, 16,000. Guéret, Creuse; population, 7,067.

Name of gas company: In Limoges, the Groupe Lyonnaise; in Poitiers, the Company General de la Gaz de France et l'Eranger; in Châteauroux, the Company Française du Centre et Euir; in Brive, the Vallette Meaume et Cie; in Guéret, the Lavenant Père.

Amount of money invested in the industry: In Limoges, 1,000,000 francs; in Poitiers, 20,000,000 francs; in Châteauroux, 5,775,000 francs; in Brive, not given; in Guéret, not given.

Process of manufacture: The process employed in nearly all French gas works is the old-fashioned one—fire-brick retorts, instead of iron, with the ordinary method of condensing and purifying.

Candle power of gas: In Limoges, 6½ to 100 liters of gas; in Poitiers, 10 to 150 liters of gas; in Châteauroux, 7 to 100 liters of gas. Not given in Brive nor Guéret.

Approximate annual output: In Limoges, 100,000 cubic meters; in Poitiers, 800,000 cubic meters; in Châteauroux, 500,000 cubic meters; in Brive, not given; in Guéret, 125,000 cubic meters.

Number of consumers: In Limoges, 12,000; in Poitiers, 250; in Châteauroux, 450; in Brive, not given; in Guéret, 75.

Price of gas: In Limoges, 300 francs per 100 meters; 150 francs per 1,000 meters to the city, and 250 francs per 1,000 meters to the railroad

company; in Poitiers 350 francs per 1,000 meters, and 300 francs per 1,000 meters to the municipality; in Châteauroux, 18, 25, and 35 centimes per cubic meter, according to the amount used; in Brive, 30 centimes per cubic meter to all consumers; in Guéret, 300 francs per 1,000 meters.

Use of gas stoves for heating and cooking: In Limoges, 400; in Poitiers, 250; in Châteauroux, 460; in Brive and Guéret, none.

Wages of employés and hours of labor: In Limoges, firemen, 115 francs per month; aides, 95 and 84 francs per month—10 hours per day; in Poitiers, 3.50 to 6 francs per day of 11 hours; in Châteauroux, 3.90 to 4 francs per day of 10 hours; in Guéret, firemen 90 francs per month; aides, 30 francs per month—12 hours per day.

Material used in the manufacture of gas where obtained, and price at the gas works: In Limoges, Lambton coal, cost 14.55 francs; Valdige coal, cost 15.50 francs; Commetry coal, cost 13.25 francs; Crausac coal, cost 15 francs; Aubin coal, cost 15 francs. In Poitiers, French coal, cost 13.25 to 20 francs. In Châteauroux, French coal, cost 13.25 to 20 francs. In Brive, Commetry coal, cost 13.25 francs. Not given in Guéret.

WALTER T. GRIFFIN,
Commercial Agent.

UNITED STATES COMMERCIAL AGENCY,
Limoges, August 28, 1890.

THE LOIRE.

REPORT BY COMMERCIAL AGENT MALMROS OF ST. ETIENNE.

I have been in correspondence with every one of the gas companies established in this district and have personally visited some of them. By far the greater number of these companies have refused to answer any of those questions, or at least any that would be of the slightest value.

This refusal was prompted by the apprehension that the information asked for by the circular might find its way back into French newspapers, to which the companies object. The following gas companies have favorably responded to every request for information, although some but incompletely.

ST.-ETIENNE.

St.-Etienne (Loire), 120,000 inhabitants.

The name of the company is the Compagnie Anonyme d'Éclairage par le gaz de la ville de St.-Étienne.

The capital of the company consists of 2,100 shares, quoted on change at 4,950 francs each. (The company declined to state the actual amount of capital subscribed and paid in.)

The process of manufacture of the gas is by distillation of coal in closed retorts.

The candle power is represented by 100 to 105 liters, equaling one carcel lamp, this latter being equivalent to 10 American candles, about.

The approximate annual output is about 8,000,000 cubic meters.

The number of consumers of gas at St.-Etienne is put down at 6,750.

The price of gas per cubic meter is 0.267 francs.

Gas stoves for heating and cooking are used by about 5,000 families.

The salaries of employés are classified as follows: Stokers, 6.15 francs; heavers, 5.40, and coal carriers 4.85 per day. The hours of work are twelve, with time to take meals on the premises.

The material used in the manufacture of gas is sifted coal obtained from the mines of the Loire, at the rate of from 17 to 18 francs per 2,000 pounds.

GRENOBLE.

Grenoble has a population of 50,000.

The name of the company is the Usine à gaz de la ville de Grenoble.

The amount of money invested in the industry is about 800,000 francs. The town is the proprietor of the works, having purchased them about twenty years ago from the company which had first introduced gas into the city, for the sum of 120,000 francs. Since then considerable improvements have been made by the municipal administration, so that to-day important benefits are realized. The appended table shows very clearly the condition of the industry in 1888:

Cost of manufacture.	Francs.	Receipts.	Francs.
Coal at 22.75 francs per ton	287,828	Sale of coke	170,720
Heating of ovens, coke and tar, first at 22.94 francs, second at 32.70 francs	80,251	Sale of coal dust	7,454
Purifying sulphate of iron at 7.70 francs	1,884	Sale of coal tar	17,598
Salaries:		Sale of ammonia, etc	31,016
The administration	21,799	Subscribers of the company (consumers)	563,521
The different workmen (classes not given)	93,268	Public lighting (streets)	112,651
Repairs, etc	23,250	Public establishments	30,175
Sundries	10,250		
Total expenses	518,530	Total receipts	933,135
		Expenses	518,530
		Net profits	414,605

One ton of coal (2,240 pounds) produced 279,320 cubic meters of gas, 630 kilometers of coke, and 45 kilometers of tar.

The process of manufacture of gas is that generally adopted in France. Seven retorts made of special fire clay distill 4,000 kilometers in the twenty-four hours, and producing each 1,000 cubic meters of gas at the same time. The purifying is obtained exclusively by means of sesquioxide of iron prepared at the works by the decomposition of sulphate of iron with lime.

The candle power of the gas is the same as that of the St. Etienne Company, as stated above.

The approximate annual output amounted to 3,195,397 cubic meters in 1888.

The number of consumers was 3,300 for the year 1889.

The price of gas per cubic meter varies as follows: The general public pay 28 centimes; the railway, 23; motors worked by gas, 20; the hospitals, 15; and the officers clubs, 10.

The number of gas stoves in use is 2,100.

The wages of the workmen are as follows: Stokers, 5 francs a day; lighters, 100 francs a month; ordinary workmen, 3.50 francs a day; those who have a special profession such as smiths, mounters, etc., receive 6 to 6.50 francs a day. The hours of work are ten.

The material used for the manufacture of gas is exclusively coal taken from the mines of the Loire, and costs at the gate of the gas works 23 francs per ton.

LE PUY.

Le Puy has 20,000 inhabitants.

The gas company is styled the Société Anonyme d'Eclairage par le Gaz de la Ville du Puy.

The capital of the company is 600,000 francs.

The process of manufacture is identical with that of the two preceding companies.

The candle power the same as that of the two preceding companies.

The annual output not stated.

The number of consumers is 550.

The price of the cubic meter of gas is 30 centimes.

The gas stoves are used by about 400 families.

The salaries of the employés are as follows: Stokers, 105 francs a month; assistant stokers, 80 to 90 francs; ordinary workmen, 75 to 80 francs. The hours of work are eleven.

The material employed in the manufacture of gas is coal from the Loire department, and the price per ton at the works is 25 francs.

ISSOIRE (PUY DE DÔME).

Issoire has 7,000 inhabitants.

The company is known as the Société par le gaz.

The capital of the société is represented by actions of the value of 130,000 francs.

The process of manufacture is the same as that mentioned for the other companies.

The candle power of the gas is not stated.

The annual output is 70,000 cubic meters.

The number of consumers is 180.

The price of gas per cubic meter is 35 centimes to the public, and 25 to the town.

The number of gas stoves in use is about 165.

The wages of the employés are, for plumbers, 110 francs a month; stokers, 100 francs.

Material used, coal; cost not given.

TULLINS.

Tullins has 5,000 inhabitants.

The name of the company is Société Anonyme du gaz de Tullins à Rives.

The capital of the société is 140,000 francs.

The process of manufacture is the same as for the others already given.

The candle power is not given.

The annual output is not given.

The number of consumers is not stated.

The price of the gas per cubic meter varies from 35 to 40 centimes. Manufacturers who consume more than 20,000 cubic meters obtain a considerable reduction.

The use of gas stoves is not stated.

The wages of the employés and hours of labor were not given.

The coal comes from St. Etienne, and costs from 25 to 26 francs per ton.

The directeur of this company in his report said that he regretted he could not give an answer to all the questions.

RIVE DE GIER.

Rive de Gier has 17,000 inhabitants.

The name of the gas company is Société Anonyme d'Eclairage par le gaz de Rive de Gier.

The capital of the company is not given.

The process of manufacture is that ordinarily used.

The candle power is that of 105 liters for one carcel lamp, equal to ten American candles.

The approximate annual output not stated.

The number of consumers not given.

The price of gas per cubic meter is 30 centimes to the general public, 25 to manufacturers, and 20 to those who make use of motors worked by gas.

The use of gas stoves for heating and cooking is extremely limited.

The wages and hours of labor of the employés are not given.

The material used is coal from St. Etienne.

OSCAR MALMROS,
Commercial Agent.

UNITED STATES COMMERCIAL AGENCY,
St. Etienne, May 20, 1890.

LYONS DISTRICT.

REPORT OF CONSUL FAIRCHILD.

Soon after receiving the circular of February last requesting information upon the subject of gas as used in this district, I sent to all the cities and towns that might be supposed to use gas a circular of which I inclose herewith a copy accompanied with a translation.

As you will readily see I endeavored to be thoroughly polite in propounding these questions, but I have not been able to obtain answers from one in ten of the cities and towns to which I wrote.

Most of them have made no reply. Some have replied that the officers whose business it was to answer were "out of town."

Some have written promising future responses, which have never come. Some have frankly said that they must decline to give any such information. They were business secrets which they were unwilling to reveal.

The course pursued by the gas company in Lyons may fairly illustrate the way in which the matter has been generally treated.

In response to my first application for the desired information it was answered, "We will send you the reply in a few days." After waiting a week and receiving nothing, another call was made by one of my clerks, and it was said: "We have been very busy; in two or three days we can do it." Another waiting and a similar promise was made. Still no report came. Then a fourth visit was made, and the agent then said: "I was sorry not to be able to comply with your request, and I hoped that you would forget all about it; but the fact is I was forbidden by the president of our company to give you the information, and I might have told you so six weeks ago."

By the following tabulated statement of the few answers which I have been able to get, you will see that no important city in the district is in this little list.

Regret that my report is so meager, but have done the best I could.

EDWARD B. FAIRFIELD,
Consul.

UNITED STATES CONSULATE,
Lyons, July 3, 1890.

[Explanations: A dash (——) indicates that no answer was given to the question. A cubic meter is 37 cubic feet, the price ranging from $1.40 to $2 a thousand feet. A kilogram is 1¼ pounds avoirdupois. A liter is seven-eighths of a quart.]

Name of city.	Population.	Name of company.	Amount of capital.	Method of manufacture.	Candle power of gas.
			Francs.		
Annecy	12,000	Lachometles & Co	205,000	Distillation of coal, purified with sulphate of iron.	5 candle burner, 105 liters an hour.
Beaune	12,000	City of Beaune	——	Ordinary distillation	18 candle burners, consume 140 liters an hour.
Eichelbreuner	2,500	Eichelbreuner	46,000	——	120 liters per hour.
La Palisse	3,000	Works belong to the village.	100,000	Sulphate of iron, lime, and sawdust in round retorts.	A burner of 5 candle power consumes 120 liters an hour.
Loire	4,500	——	220,000	Distillation of coal	9 candles.
Montbéliard	9,000	Gas Company of Mountbéliard.	110,000	Distillation of coal, lime, and sulphate of iron.	150 liters, 6 candles.
St. Claude	8,000	——	200,000	do	7 candles.

Name of city.	No. of cubic meters per annum, approximately.	Number of consumers.	Price of gas per cubic meter.	Use of gas stoves for cooking and heating.	Wages of employés and hours of labor.	Material used; where obtained; price at gas works.
			Cents.			
Annecy	350,000	500	6	Two-thirds of the consumers use for cooking.	90 to 120 francs a month.	Coal from Loire. Price, 30 francs per 1,000 kilos.
Beaune	200,000	400	5	——	9 cents an hour, 12 hours.	Coal from Blanzy. Price, 24 francs a ton.
Eichelbreuner	40,000	90	7	——	125 francs a month.	St. Etienne coal, 3 francs 100 kilos.
La Palisse	40,000	90	6	About 60 stoves.	One man receives 2,000 francs a year besides lodging, light, firewood, and garden. Another 70 francs a month, 12 hours a day.	St. Etienne or Loire coal, cost 25½ francs 100 kilos.
Loire	100,000	160	7½	75 stoves	3½ francs a day, 12 hours.	Coal from Dutveiller, 30 francs 1,000 kilos.
Montbéliard	189,326	270	5	Some use it in cooking.	Wages from 2 to 5 francs a day, 10 to 12 hours.	Mount Rambert coal, 27 to 35 francs a ton.
St. Claude	200,000	180	7½	Generally used in cooking.	From 75 to 135 francs a month, 12 hours.	Coal from Blanzy. Price 26½ francs 1,000 kilos.

MARSEILLES.

REPORT BY CONSUL TRAIL.

Population of the city and environs, 425,000.

Name of gas company, Compagnie du Gaz de Marseille (Société Anonyme de l'Eclairage au Gaz et des Hauts Fourneaux et Fonderies de Marseille et de Mines de Portes et Sénéchas).

Amount of money invested in the industry, 21,500,000 francs in gas, furnaces, and founderies, and mines of Portes and Sénéchas.

Process of manufacture, coal gas, purified by water and lime.

Candle power of gas, seven candles of the mark "étoile" for one jet of 105 liters.

Approximate annual output, 15,000,000 cubic meters.

Number of consumers, 13,500.

Price of gas per cubic meter, 17 centimes for the city Marseilles, and 33 centimes for private consumers.

Gas stoves for heating and cooking are very generally used with illuminating gas, but no information furnished by the company.

Wages of employees and hours of labor: Ordinary labor, 3 to 3½ francs per day; stokers and assistant stokers, 4 and 5 francs; mechanicians, 5 francs; twelve hours of labor with an interval of two hours for rest and food. The retorts are charged six times in the twenty-four hours. It takes four hours for the charging, and, as this work is more severe sometimes than at others, the time allowed for rest varies according to the severity of the labor.

Material used in the manufacture of gas, where obtained, and price at the gas-works: The company do not reply to this question, other than that they use English and French coal (probably Newcastle and St. Etienne), and price at the gas works, 30 to 37 francs.

The company was disinclined to furnish any information whatever, but stated that several years back full answers to all the questions were given to the consul at that time, and that that information is now in the possession of the American Gas Company or Society of Philadelphia.

CHARLES B. TRAIL,
Consul.

UNITED STATES CONSULATE,
Marseilles, August 31, 1889.

NICE, CANNES, AND MENTONE.

REPORT BY CONSUL BRADLEY.

Nice, 80,000 inhabitants; Cannes, 20,000; Mentone, 10,000. Comparatively few of the inhabitants use gas, preferring their candles, common oil lamps, or kerosene. Even in the public stairways and halls the belated occupant still carries his candle end and matches to help him grope his way up to his apartments.

At Nice we have the "Société Anonyme d'Eclairage et de Chauffage par le Gaz." Its capital is 3,750,000 francs.

The gas is manufactured from Newcastle coal, delivered at the works by ships at about 29 English shillings per long ton (2,240 pounds). It is made in "closed pots," ordinary furnaces, tar furnaces, and recovering furnaces. Their method of expressing power is to say that it takes 105 liters to make a light equal to that of a Carcel lamp. The annual output of the plant is 5,350,000 cubic meters which is taken by 6,000 consumers, about 25 per cent using it in connection with cooking.

The price is 15 centimes to the city, 18 centimes for cooking, and 25 centimes per cubic meter for lighting.

Labor receives: Firemen, 1½ francs; mechanics, 3 francs per day of 12 hours.

The cities of Mentone and Cannes are served by a Swiss company which has factories in the south of France in different cities. It is called Compagnie Genévoise de l'Industrie du Gaz. They will tell nothing in regard to their affairs. All that the public know is that their capital is 10,000,000 francs, that they charge 30 centimes per cubic liter for lighting and 25 centimes for cooking gas, and that they use Newcastle coal.

WM. HARRISON BRADLEY,
Consul.

UNITED STATES CONSULATE, *Nice, June* 9, 1890.

NORTHERN FRANCE.

REPORT BY CONSUL WILLIAMS OF ROUEN.

INTRODUCTORY REMARKS.

In 1820 John Grafton, a pupil of Clegg, invented clay retorts in several pieces jointed by a cement not liable to be destroyed by fire, they having formerly been made in one piece. Haddock about the same period patented the means of purifying gas from ammonia by passing through dilute acid. In this year John Malam patented the first dry-meter. This proved to be a very unfinished instrument but attracted the attention of other inventors, and among the earliest being Bogardus, an ingenious American, whose invention was patented by Miles Berry in 1833.

The above-named inventions gave an impetus and character to the establishment of gas factories on the Continent of Europe.

In 1833 the French National Gas Company was projected for lighting Boulogne-sur-Mer, but their capital of £10,000 being found insufficient, the business was handed over in 1835, to a new association, the present European Gas Company, which was formed for this purpose, and also for lighting other towns in Europe, with a capital of £200,000. The lighting of Amiens was undertaken in 1835; and a concession for a part of Rouen and other French towns was undertaken in 1846. All the plant for these gas works had to be sent from England, and very few of the articles required to carry on the business could be obtained in France, except at prices considerably in excess of those charged by English manufacturers.

Great difficulty was encountered in persuading the inhabitants to use gas in their shops and dwellings and this could only be overcome by sacrificing a considerable amount in fittings, which in many cases had to be given away, or let at a nominal rent.

This company committed the capital fault of not securing their position by exclusive privileges, and later on, when they became successful, they suffered from this neglect, or want of confidence, by seeing competing French companies established at Amiens. In several of the towns the opposition was bought off in 1860, but Amiens was divided into districts, one of which had to be given to the French company. The European gas companies have realized that they had to compete with the encroachments arising from electricity and that they must carefully watch the improvements and discoveries which are continually taking place in the manufacture of gas. They, therefore, have organized and formed a society composed of the managers of all the important gas works in France, known as "La Société Technique de l'Industrie du Gaz en France" (Technical Society of the Gas Industry in France). They visit and examine the manufacture of gas in other countries, and at their annual meetings receive statements and appoint committees to investigate and report upon the different and various branches of the gas industry.

The proceedings with carefully prepared designs are printed in fine form and placed in the hands of their members.

These meetings are held in different cities of France each year, and serve to instruct and strengthen and protect the gas interest of the country.

One hundred and forty-five members were present and took part in their congress at Boulogne-sur-Mer in 1889, while 222 attended the meeting in 1886 at Paris. A similar institution known as the "Gas Institute" exists in London, and these societies exchange visits and correspond from time to time.

At Paris large and comfortable offices are provided and are open from 1 to 4 p. m. A complete library on the subject of gas, and gas journals are at the disposal of the members. For the distribution of prizes, rent of offices, addition to library, and attendance, a sum of about 34,000 francs is annually expended, and from their surplus a permanent fund of about 100,000 francs has been established.

At the Paris Exposition, the society made a very creditable display of all apparatus and tools used in the manufacture of gas, and the funds for this work were liberally contributed by the gas companies. They thus have nothing to fear from competition among themselves, and can reserve their strength to combat against kerosene, electric lights, etc.

Strikes and the strained relations of the workmen in and out of the mines are sources of trouble against which it is more difficult to provide.

GAS CONSUMING CITIES AND COMPANIES.

All of the cities, and most of the market towns, and many of the villages in this consular district use gas. The diversified and important manufacturing interests which are scattered over this region offer the

greatest facility for the establishment of gas works and insure success. As soon as a large factory is established near a villa market town, the municipal authorities make overtures to the m facturer for a share in the gas works which supply the factory an public buildings, street lamps, and private houses have the bene the light.

The proximity of the coal mines in this district, and the faci offered by rail and water for transportation from the mines to th tories, as well as the easy and cheap conveyance by water of En coal to the numerous ports of this portion of the coast, and the ac ibility of the Belgian mines, tend to develop the spread of these w

The gas industry is far from being concentrated in any one cor tion, which would enable me to reply in the singular number ad in the question. When a town decides to adopt gas, proposals a quested from contractors, and the party offering to furnish at the est price per cubic meter is awarded the official contract for a te twenty-five or thirty years.

Cities.	Population.	Gas companies.
DEPARTMENT OF EURE.		
Les Andelys	5,474	Continental.
St. André	1,523	A. Guersent.
St. Aquilin	447	Usine de Pacy.
Bernay	8,310	Co. Centrale.
Bretiul-sur-Iton	2,095	A. Pillard-Soulain.
Brionne	3,746	Soc. du gaz Maubeuge.
Charleval	1,618	Western Co. of France.
Conches	2,094	Pillard-Soulain.
Damville	1,176	Vidou Guilman.
Douville	435	Usine de Charleval.
Droucourt	1,100	Ch. Georgi.
Évreux	16,755	Continental.
Ezy	1,572	Usine d'Anet.
Fleury-sur-Andelle	1,448	Usine de Charleval.
Gaillion	3,488	Gaz de Maubeuge.
St. Germaine Village	804	Usine de Pont-Audemer.
Gisors	4,352	Em. Lebon.
Louviers	10,753	Co. générale de France.
Neubourg	2,414	J. P. Delarue.
St. Nicolas	2,414	Usine de Charleval.
Pacy	1,945	Haulleville.
Perruel	416	Usine de Charleval.
Pont Audemer	6,163	Alleau & Co.
Pont-Authou	522	Usine de Brionne.
Pont-St.-Pierre	2,000	Usine de Charleval.
Radepont	1,800	Do.
Serquigny	1,261	Usine de Brionne.
Thiberville	1,379	Ch. Georgi.
Vascoeuil	401	Usine de Charleval.
Verneuil	4,200	Foret.
Vernon	7,881	Co. générale de France.
DEPARTMENT NORD.		
Saint-Amand	12,187	A. Delille.
St-André-lez-Lille	2,053	Usine de Marquette.
Aniche	6,253	Soc. Anonyme.
Anor	5,531	Do.
Anzin	10,656	Usine de Valenciennes.
Armentières	27,985	Co. Contin.
Auby	2,277	Usine de Douai.
Aubnoy-les Berlamont	1,402	Soc. Anonyme.
Avesnes	6,092	Soc. du Nord.
Bailleul	13,335	Soc. de Lacroix Divoor.
La Bassée	3,678	J. Vaast.
Bavay	1,897	Fusion des gaz.
Beauvois	3,406	Jean.
Bergues	5,435	Co. générale Belge.
Bouchain	1,859	Desmoulins.
Bourbourg	2,194	Soc. en comm.
Bousbecques	2,415	Usine de Menin, Belgium.
Brunai	4,549	Co. general of Belgium.
Cambrai	23,881	Do.

Cities.	Population.	Gas companies.
DEPARTMENT NORD—Continued.		
Cassel	4,275	Soc. locale.
Le Cateau	10,007	Soc. du Nord et de l'E.
Caudry	5,389	Co. Française.
Comines	6,637	Do.
Condé-sur-Escaut	5,172	A. Delille.
Coudekerque	2,904	Co. générale Belge.
Crèvecœur	2,569	Usine de Masnières.
Croix	9,528	Usine de Roubaix.
Denain	17,832	Soc. du Nord et l'Est.
Dougnies	.....	Usine de Douai.
Dunkerque	38,025	Co. gén. Belge.
Estaires	6,823	Comp. Cont.
Ferrières	404	Usine de Maubeuge.
Fives-Lille	.....	Ed. Melon.
Fontaine au Pire	1,934	Usine de Beauvois.
Fourmies	14,771	Co. gén. Belge.
Fresnes	6,698	Vincent et Co.
Glageon	2,188	Usine de Trélon.
Gravelines	5,946	Soc. Anonyme.
Halluin	14,020	Usine de Menin.
Hautbourdin	7,063	Usine de Loos.
Hautmont	9,317	Pige.
Hazebrouck	11,332	Soc. Belge.
Hellemmes	3,880	Ed. Melon.
Hem	3,320	Usine de Roubaix.
Houplines	6,230	Usine d'Armentières.
Jeumont	3,044	Fusion du Gaz.
La Gorgue	3,885	Usine d'Estaires.
Lambessart	2,775	Usine de Marquette.
Landrecies	4,279	Alph. Pasquet.
Lannoy	1,990	Usine de Roubaix.
Lille	188,272	Co. Imp. Continent.
Lormme	4,836	Usine de Wazemmes.
Loos	6,706	Ed. Melon.
Louvroil	3,477	Usine de Maubeuge.
Lys	3,773	Usine de Roubaix.
La Madeleine	8,504	Usine Marquette.
Marchiennes	3,925	J. Vaast.
Marcq-en-Barœul	9,418	Usine de Marquette.
Marcoing	1,936	Usine de Masnières.
Masetz	3,684	Traisne & Poête.
Marly	2,206	Usine de Valenciennes.
Marpent	1,135	Usine de Jeumont.
Marquette	4,000	Ed. Melon.
Masnières	1,983	Brouette & Harcart.
Maubeuge	18,329	Gaz de Maubeuge.
Merville	7,525	Annebique.
Mons-en-Barœul	2,383	Usine de Fives-Lille.
Mouveaux	3,678	Usine de Roubaix.
Nieppe	5,207	Usine d'Armentières.
Ohain	1,387	Usine de Tilon.
Orchies	3,757	Capron fils.
St. Pol	5,200	Soc. Anonyme.
Le Quesnoy	3,765	Ch. & G. de Rivery.
Le Quesnoy-sur-Deule	5,051	Soc. Anonyme.
Raismes	4,896	Jouglet.
Roncq	5,716	Soc. Anonyme.
Rosendael	6,233	Usine de Dunkerque.
Roubaix	100,299	Desclées frères.
Sains	4,235	A. des Perrières.
St. Saulve	2,564	Usine de Valenciennes.
Scalin	5,858	Ed. Costemend.
Solesme	6,413	M. Fatres.
Solre le Château	2,669	Ed. Pourpoint.
Somain	5,794	Soc. Anonym.
Steevoorde	4,368	Soc. locale.
Tourcoing	58,008	La Ville.
Trelon	3,496	Soc. Eau & Gas.
Valenciennes	27,607	Co. gén. Belge.
Vervicq (Sud)	2,545	Usine de Vervicq, Belgique.
Vieux Condé	6,568	A. Delille.
Wambrechies	4,239	Usine de Marquette.
Wasquehal	3,688	Usine de Roubaix.
Wattrelos	15,725	Do.
Wazemmes-Lille	.....	Ed. Melon.
Wignehies	5,705	Capron & Co.
DEPARTMENT PAS DE CALAIS.		
Aire	8,736	L. Divoor.
Arras	26,914	Co. gén. Belge.
Arques	5,567	Vergriette.
Auxy-le-Château	2,934	Ch. de Rivery.
Bapaume	3,291	Soc. locale.

Cities.	Population.	Gas companies.
DEPARTMENT PAS DE CALAIS—continued.		
Beuck-sur-Mer	5,187	A. Deplanque.
Bèthune	10,917	Co. fr. del'Ind. du Gas.
Billy-Montigny	1,831	Eichelbrenner.
Boulogne-sur-Mer	4,916	Co. Europ.
Do	4,916	Usine de la Gare.
Bully-Grenay	2,797	Eichelbrenner.
Calais	58,969	C. Française.
Sarven	7,806	A. Delille.
Sainte Chaterine	833	Usine d'Arras.
Courrières	3,469	Usine de Billy-Montigny.
Desvres	4,487	A. Deplanque.
Frisent	4,312	Jacquiot.
Fruges	3,172	Soc. loc. Eichelbenner.
Guines	4,374	Do.
Henin-Lietard	6,546	Capron & Co.
Headin	3,520	Soc. loc. Eichelbrenner.
St. Laurent-Blangy	1,925	Usine d'Arras.
Lens	11,780	A. Delille.
Liévin	10,718	Soc. Anonyme.
Lillers	7,473	Soc. Locale.
Marquise	4,333	A. Deplanque.
St. Marten	4,017	Usine de Boulogne-sur-Mer.
Montreuil-sur-Mer	3,352	A. Deplanque.
Oignies	1,700	L. de Clere.
St. Omer	22,266	Co. Générale Belge.
Outreau	3,178	Co. Europ., Usine de Boulogne.
St. Pol	3,797	Soc. loc. Eichelbrenner.
Pont de Brique	.....	Usine de Boulogne.
Le Portel	5,110	Do.
St. Venant	2,944	Deplanque & Co.
DEPARTMENT SEINE INFÉRIEURE.		
Bon Secour	1,549	Usine de Rouen.
Caudebec-en-Caux	2,313	G. Lesage.
Caudebec-les-Elbeuf	11,290	Co. du gaz d'Elbeuf.
Darnetal	6,609	Hervieux.
Deville	5,114	Soc. locale.
Dieppe	23,050	Co. Centrale.
Doudeville	2,983	Litre.
Duclair	1,913	Usine de Barentin.
St. Etienne de Rouvray	4,246	Usine de Rouen.
Elbeuf	22,104	Soc. Anonyme.
St. Leger-du-Bourg-Denis	1,161	Usine de Darnetal.
Maromme	3,349	Usine de Deville.
Oissel	4,015	Co. Europ. de Sotteville.
Pavilly	4,014	Usine de Caudebec.
St. Pierre	4,014	Do.
Grand Quevilly	1,313	Usine de Rouen.
Petit Quevilly	10,273	Co. Europ. de Rouen.
Roncherolles le Vivier	389	Usine de Darnetal.
Rouen	107,163	Co. Européenne.
Do	107,163	Soc. en Commandite.
Sotteville	15,304	Co. Europ.
DEPARTMENT SOMME.		
Abbeville	19,837	P. de Lachomelle.
Albert	5,821	J. N. Deschamps.
Amiens	80,288	Co. Européenne.
Do	80,288	Soc. Anonyme.
Do	80,288	Usine de la Gare.
Condé-Folie	1,091	Usine de Longpré.
Corbie	4,594	Mortreux aîné.
Le Crotoy	1,761	Grognet Gomlam.
Doultens	1,368	Mathis & Co.
Gamaches	2,101	Ch. de Rivery & Co.
Ham	3,043	Poiret & Co.
Longpré-les-Corps-Saints	1,776	Co. de Maubeuge.
Lonquèau-les-Amiens	686	Virly.
Meharicourt	1,031	Usine de Rosières.
Montdidier	4,679	Mangot.
Moreuil	3,377	Melon-Hacart.
Morisel	582	Usine de Moreuil.
Nesles	2,455	La Ville.
Peronne	4,759	Soc. locale.
Roisel	1,807	Brouette.
Rosières	2,635	Lefèvre, Lefranc.
Roye	3,888	Annibicque.
Rue	2,677	G. Garry & Co.
St. Valery-sur-Somme	3,506	Ch. Georgi.
Villers-Bretonneux	5,911	Eichelbrenner.

CAPITAL INVESTED.

There are manufactories and other works in which the yearly consumption of gas is equal to that of some towns of 10,000 or even 15,000 inhabitants. For supplying such an establishment with gas the capital is principally invested in buildings and apparatus, but little being required for mains within the premises, and it might be naturally supposed from these favorable circumstances that the gas would be produced at a cheaper rate than if supplied by a public company with their costly distributing mains, but such is rarely the case. This is easily explained, for it is not to be supposed that the various points of excellence in a company's works with the manager's experience can be attained by the attendant in charge of a small works, who is often engaged in the first instance with but scant knowledge of the art of gas-making.

Gas works for the supply of a town or district requiring a considerable length of main producing less than a million cubic feet per annum are scarcely remunerative, unless under very exceptional circumstances, but as they increase in magnitude so do the prospects of profit from them improve. In all cases, however, in which a manager can render a works of the annual production of a million and a half or two million cubic feet satisfactory to the shareholders, he may be congratulated on his success.

COST.

The expenses of establishing gas works vary not only in different countries, but also in the various works of the same country.

For France the following are from good authority:

Cost per cubic meter of gas.

[28 cubic meters = 1,000 cubic feet.]

	Francs.	
Gas works of Paris	0.75 to	0.80
Production of 2,000,000 cubic meters per year and upwards	0.90	1.00
Production of 1,000,000 to 1,800,000 cubic meters per year	1.20	1.30
Production of 500 to 800,000 cubic meters per year	1.30	1.50
Production of 300,000 to 450,000 cubic meters	1.50	1.60
Production of 100,000 to 300,000 cubic meters	1.80	2.00
Production of 100,000 cubic meters	2.00	3.00

This price applies to actual cost and not to any speculative value. In the above expenses are included the gas conduits and fixtures for lighting streets and public buildings, which would represent 30 to 40 per cent of the capital, the balance being applied to the gas works.

The duration of a gas works is estimated at about thirty years, and if 5 per cent additional is allowed for interest on capital these two items would be thus represented: From 0.05 for interest on capital, 0.015 sinking fund, total, 0.065, which makes a heavy charge per cubic meter; and if we take an example of a works costing 1,200,000 francs, and producing 1,500,000 cubic meters of gas, estimating the cost of

manufacture and adding the charges on capital, we would have for use of capital—

	Francs.
$\frac{7}{100} \times 1,200,000 \times \frac{1}{1,500,000}$	= 0.056
Cost of manufacture	0.100
	0.156

Thus is plainly shown the important role which capital plays.

Some cities have contracted with large companies, such as the European Gas Company (limited), with a capital of 17,703,000 francs. It has works in several cities of this district. Societé Anonyme Belge, a French and Belgian company, with a capital of 20,000,000 francs, having its central office at Brussels, Belgium, or with companies whose charters authorize them to issue more stock than they require, and thus hold large amounts in their treasury.

The Rouen Gas Company, which shares with the European Gas Company the lighting of the city of Rouen, has a capital of 6,000,000 francs.

The contract for lighting the city of Roubaix, of the firm of Desclée Brothers & Company, of which I have a copy, is a very clear, business like document, and provides for almost any contingency which might arise during the fifty years of its life, thirty of which have already expired.

By this contract the construction and care of all of the street lamps and burners and those of public buildings, except in case of construction of ornamental chandeliers, become the duty of the contractors.

If coal advances beyond the standard of 34 francs per ton, for each 2 cents of advance per ton an advance of a farthing per cubic meter can be charged. In a word, every contingency likely to arise seems to have been provided for as far as in the power of human foresight to protect both parties.

I have been made acquainted with the details of several similar contracts, and consider them a good study for gas manufacturers, although translated copies would not be admissible in a summary of this scope. There is no doubt that these contracts are profitable.

PROCESS OF MANUFACTURE.

Gas is generally produced by the simple distillation of coal. In some small private establishments heavy oils are still employed.

The process of carbonization of coal for the production of illuminating gas is of the utmost importance in a gas works, for upon its efficiency depends the quantity, quality, and purity of the gas, and the quality of the residuary coke available for sale; the expense of labor and the wear and tear of the ovens, settings, and retorts; all matters of great importance to the pecuniary success of the gas undertaking.

This subject has been closely studied by the French, and experiment after experiment has been made with different mixtures of coal in retorts

and furnaces to obtain the greatest amount of gas and residuary coke of best quality with the cheapest fuel.

The length of time required for extracting all of the gas from an ordinary charge of coal of any description is controlled by the heat of the retorts. For a given quantity of Newcastle (much used here) when submitted to a temperature somewhat above cherry red (1650° F.), and requiring six hours for distillation, would be effectively distilled in five hours at 2000° F., and in four hours when the heat is slightly above 2190° F., and undoubtedly this rapid production with high heats is one of the causes of its being favorably regarded by many of the french gas makers.

The European Gas Company and several of the others favor the longer period, considering that the quality is of a lower illuminating power when the coal is carbonized too rapidly, and the quality of the coke is inferior, and certainly the battery, in not being subjected to so great a strain by the excessive heat required to hasten the carbonization, has less wear and tear.

HEATING OF FURNACES BY COKE, WITH COKE DUST, AND BRIQUETTES COMPOSED OF COKE DUST AND TAR.

In small gas works, coke mixed with coke dust, and briquettes of tar and coke dust, have given very satisfactory results. In important centers, where the coke can be advantageously sold, the refuse coke dust made by the coke-breakers is utilized in the furnaces of the gas works. The proportion of this fuel used in distilling a ton of coal is about: Coke, 211 pounds; briquettes, 106 pounds; dust, 100 pounds. In a gas works distilling 15,000 tons of coal the product is of coke, 9,750 tons; dust, 975 tons; tar, 750 tons. Coke is usually salable, but in utilizing the tar and dust which are almost valueless, this refuse will be more than sufficient to heat the furnaces, the remainder, about 250 tons, can be used for exhausters, and the extraction of sulphate ammonia or other necessary purposes. The European gas works consume briquettes composed of coke, dust, tar, and pitch, which they manufacture on the spot at a trifling expense and use in heating their retorts. This is a comparatively valueless subproduct, not costing more than about 5 francs per ton, and they are thus enabled to sell their coke at 25 francs or more per ton, and a large quantity of tar at 25 to 30 francs per ton. The latter is extensively used in the manufacture of briquettes, pavements, and in refineries as a revivifier. This company also manufacture what is termed Charbon de Paris (Parisian charcoal), which resembles charcoal in form, and only differs from it in every essential element, but burns slowly, and is in great demand for cooking in summer, especially in furnace grates, which are found in every French kitchen. This charcoal is sold for about $1 per 100 pounds, and is composed of coke dust, pitch, and tar, pressed and molded and baked in ovens.

This company use in the scrubbers oxide of iron and sawdust, which they prefer to lime on account of economy. Although a slight amount of carbonic acid is thus disengaged and unites with the gas and tends to lower the quality, they say that their gas is always above the standard. Tar is successfully employed in heating the furnaces, being introduced together with superheated steam, but the ready sale of tar at fair prices prevents its general use. A description of the works at Boulogne-sur-Mer and the cost of machinery used at Tourcoing in the manufacture of gas, and some plates of a few of the machines used in heating, exhausting, purifying of gas, etc., explain themselves readily, and if they do not convey a clear idea of the process or processes in use here for gas manufacture, will show that the difference between gas manufacturing is very little the world over. The residuary matter is economized carefully here, and the production is about 11,000 cubic feet of gas per ton, and the space occupied by the works is considerable, and every process and all machines throughout the works are in duplicate, while furnaces and retorts are in great excess. There are no automatic machines used in this part of France for charging and discharging retorts.

In the transactions of the Société Technique are a few notes upon the gas works at Boulogne-sur-Mer which may serve to give an idea of the general construction of gas works in this part of France. These works, although not so large as some, rank among the best in their appointments and general management. The gas works at Boulogne-sur-Mer were among the first established in France, dating back to 1834, since which time they have been submitted to many alterations, the most important of which were effected in 1871 and 1882. They are situated on the banks of the river Liane, and by the side of the railway leading from Boulogne to Calais, being thus advantageously located to receive coal by water and rail, and occupy a space of 17½ acres. They consist of a furnace chamber of two batteries, and seven ovens with seven retorts each. These retorts, supplied by the Society of Phosphates, are provided with buffers for closing without cement in the form of a letter D the Morton system. The rising mains and plungers have an interior diameter of 6 inches. The hydraulic mains of sheet iron are placed at a distance of 39½ inches above the foundations of the ovens, the outlets of 8½ inches communicate with an hydraulic main condenser of sheet iron of 0.600 meter in diameter, which follows the walls of the batteries for the length of 273 feet, joining itself to a cooler along the exterior wall of the battery No. 1. This cooler is composed of four horizontal tubes of 15¾ inches in diameter by 185 feet in length.

The gas is extracted in winter at the rate of 20,000 cubic meters in twenty-four hours, and in summer at half that rate. These extractors are with their motors in duplicate. The boilers are placed in the side of the extracting chamber. The gas then passes through a condenser (Pelouze) No. 6, which disengages the tar, to the scrubbers; these last

are four in number, have 19.8 feet of height and 5 feet in diameter. The three first, provided with joist or boards, are moistened with ammoniacal water graded down to less and less strength; the fourth, furnished with carpenters' shavings, is moistened with pure water. The purification is made by means of twelve purifiers of cast iron with sheet iron lids of 5.2 by 5.2 feet, and inclosing the material Laming. Three of the meters can measure 20,000 cubic meters per twenty-four hours, the others 10,000 cubic meters. Two gasometers placed within the works have a capacity, the one of 26,000 meters and the other of 6,000 meters, a third of 12,000 meters is built outside of the works. The emission is made by means of four governors, one of which is on the System Giroud, with return tube. The coke is broken by an Obertin machine driven by a four horse-power engine. Two large cisterns serve to store the tar and ammoniacal water; the last named is transferred into special reservoirs and used in the manufacture of sulphates. There are two systems of manufacture: (1) The system Chevelat, (2) the system Mallet modified by Chevalet. The coal storehouse can stow 6,000 tons. There are also blacksmith shops, buildings, and work shops for repairs of meters, for the bronzing of tools, and correction of meters, and a shop for the sale of apparatus.

The Commune of St. Martin is supplied with gas from these works. The European Company supply in the same neighborhood from works at Ontreau, Portel, St. Etienne, St. Leonard, Isgires, and Condette. The gas pipes of the works at Boulogne-sur-Mer are extended 70,544 yards; at Ontreau, 15,122 yards.

Gas works of Tuscoing.

	Francs.
Wooden coal shed	20,000
Weighing room and scales	15,000
Coals under sheds and under weighing room	45,000
Three fireproof chambers	67,000
Furnaces under chambers	110,000
Pipes and valves	60,000
Wooden condensing house	10,000
Metallic apparatus used in condensing house	34,000
Chamber generators, fireproof	8,000
Two steam generators and their accessories	10,000
Three chimnies	15,000
Steam crane for carrying coals	10,000
Buildings, shop, and blacksmiths'	10,000
Tools	16,000
Manager's house	18,000
Director's house	22,000
Office	14,000
Furnishing office, books, etc	15,000
Buildings, machinery, chambers for purifying and revification	83,000
Metal, machines, pumps, counters, purifiers, swing bridge, pipes, etc	207,000
Siphons or drip well	3,000
Material for the same	3,000
Clocks, gasometers, etc	180,000

Gas works of Tuscoing—Continued.

	Francs.
Tanks for tar	6,000
Pipes, etc., for conducting tar	3,000
Building for making salt of ammonia, cisterns and chimneys	20,000
Apparatus for making ammonia	8,000
Building for coke-breaker and a gas machine	4,300
Coke-breaker, gas machine, etc	12,000

CANDLE POWER OF GAS.

In France the standard light for gas testing is the Carcel lamp, burning colza oil at the rate of 648 grains per hour, equal to 8.21 sperm candles. The candle test is the one most familiar to the public and is likely to hold its ground.

It seemed to more fully meet the requirements that, as the value of any light-giving material is its effect upon the human eye, the only proper test is that of actual vision.

The best standards of light comparison at present known are undoubtedly the Carcel lamp, burning pure refined colza oil, as used in the French system of photometry, and the modified form of the moderator lamp, burning pure sperm oil, as proposed by Mr. Keates, the consulting chemist and superintending gas examiner to the metropolitan board of works, London. Before, however, discussing the comparative merits of either of these standards it will be well to briefly state the reasons for considering the present candle standard as untrustworthy.

A lamp consuming sperm or refined colza oil appears to be a far more reliable standard of comparison than sperm candles.

In Messrs. Kirkham & Sugg's experiments considerably less variation was found when using a Carcel lamp than when using candles; for while with the latter means of comparison a maximum error of 4.6 candles was obtained, the greatest deviation from absolute lighting value in the case of the Carcel lamp burning pure colza oil was only 2.3 candles. When the lamp was carefully trimmed and attended to the greatest deviation was still less, amounting to only 1.69 candles. No experiments were made at the same time with Mr. Keates's lamp, so that we have no opportunity of judging what is its value as compared with the Carcel lamp. As far as our present knowledge extends there is every reason to believe that a lamp standard is more accurate than the use of candles, although for portability, cleanliness, and facility of manipulation the latter can not be surpassed. Admitting the durability of a lamp as a standard the question for settlement is, what oil is the most suitable for use? Mr. Keates has very ably considered this part of the subject and concludes in favor of sperm oil. The special suitability of this oil over all others arises from the following considerations: That it is obtained as a natural product, by simple expression, and is not subsequently submitted to any chemical treatment whatever; that it will burn more evenly and with less clogging to the wick than any of the vegetable oils; that it is not liable to the variations in character

which necessarily attend vegetable oil expressed from seeds of different ages and grown on different soils; and lastly, that its unusually low specific gravity affords a ready test of purity, excluding, as it must, adulteration with the commoner oils, all of which possess a higher specific gravity than that of sperm. To these considerations may likewise be added another, viz, the fluidity of sperm oil as compared with most of the vegetable oils, which property no doubt materially affects the evenness of combustion in facilitating the ready rising of the oil up the wick. The total weight of the lamp, when charged with oil and counterbalance, is about 7 pounds.

The lamp is constructed on the principal of the common moderator, and the flow of oil is regulated by a series of slots in the wick-holder, crossed with a sliding cylinder of thin metal, which is capable of being shifted up or down, and of thus regulating the size of the apertures from which the oil flows.

The dimensions of the lamp are as follows:

	Inches
External diameter of the outer tube of burner	1.08
Internal diameter of inner tube of burner	0.75
Whole height of chimney	9.45
Height to shoulder of chimney outside	2.35
Internal diameter of bottom of chimney	1.90
Internal diameter of top of chimney	1.20
Regulator of overflow, mean distance below the edge of outer tube	0.50
Mean height of flame, burning about 760 grains of oil per hour	2.50

The wick is that ordinarily used for sperm oil, one inch of which in length weighs in the dry state 7.60 grains. It was found that this lamp burned about 760 grains of oil per hour as the normal consumption, giving a light of, as nearly as possible, 10 candles. Any consumption above or below the normal amount was corrected by an ordinary rule-of-three sum. Mr. Sugg has recently improved this lamp so as to afford a light of 16 candles.

Fig. 2 shows the Carcel and balance on the French system. In this method the lamp is maintained at a constant consumption, and the illuminating power of the gas judged from the quantity of gas required in a given time to produce a light equal to that of the lamp.

The dimensions of the lamp are as follows:

	Inches.
External diameter of the burner	0.9055
Internal diameter of the interior air tube	0.6692
Diameter of the exterior of the air tube	1.7912
Total height of the chimney	11.4170
Distance from the neck to the base of the chimney	2.4015
Exterior diameter at the level of the neck	1.8503
Exterior diameter at the top of the chimney	1.3385
Mean thickness of glass	0.7870

The wick is that quality known as lighthouse wick, and having a plait of 76 strands, 4 inches weighing 55.5 grains. The oil is purified colya, and the consumption is regulated to 648 grains per hour.

OUTPUT AND CONSUMPTION.

The extent of territory over which the gas interest extends precludes the possibility of even correctly estimating the number of consumers. The director of a gas works at Rouen told me that he had directed a census to be made of houses and apartments inhabited by families in the territory which came within his jurisdiction to supply, and found that they numbered 23,000, although he supplied but 5,000 customers. In Boulogne-sur-Mer the list of consumers numbers 2,739. In Calais, it is computed that gas is used by about one-third of the inhabitants. This proportion would not vary much throughout the consular district. Kerosene is the only serious competitor for household illumination, and on account of duty, and the good understanding existing among the refiners, it is held at such a high figure (about 35 cents per gallon) as to be comparatively harmless to gas interests.

The electric lights are growing in favor and have already been introduced into many shops and factories. The strenuous efforts made to induce householders to introduce gas and its increasing use for heating and cooking keep the demand at its usual standard.

PRICE OF GAS.

The price of gas varies from 21 centimes per meter (5.88 francs per 1,000 cubic feet) at Lille, with a descending scale in favor of the lighting of municipal buildings—15 centimes per meter (4.20 francs), and street lamps at 0.07 millimeters (1.96 francs)—to 30 centimes per cubic meter (8.40 francs per 1,000 feet), which is the price charged at some of the smaller gas works. Dunkirk and suburbs, with an output of 56,000,000 cubic feet, supplying a population of 50,000, pays 6.44 francs (per 1,000 cubic feet) in summer to ordinary consumers; 6.14 francs (per 1,000 cubic feet) in winter, making large deductions to the municipality and large consumers. At Roubaix the charge is 5.60 francs per 1,000 cubic feet, from which price deductions are made on the following scale: Upon the first 56,000 cubic feet, nothing; 56,000 to 112,000 cubic feet, 28 centimes per 1,000 cubic feet; 112,000 to 168,000 cubic feet, 56 centimes per 1,000 cubic feet until a consumption of 382,000 cubic feet, when a deduction of 1.64 francs per 1,000 cubic feet is made, and a still further deduction of 28 centimes is made for an excess over that amount. The gas for motors is furnished at 3.92 francs per 1,000 feet, unless the consumption entitles to the discount above named.

At Calais and Boulogne-sur-Mer the price is 7 to 8.40 francs per 1,000 cubic feet for domestic use, and very little more than half that price for lighting of public buildings and streets. At Boulogne-sur-Mer the annual output is about 100,130,000. At Rouen the output is about 350,000,000 cubic feet, and the price is graded from 7 to 4 francs, according to quantity and uses. The installations are at 20 centimes per week for one or two burners, 25 centimes (5 cents) for three burners, 30 centimes *(6 cents)* for five burners.

GAS STOVES.

The gas managers at Rouen state that nearly every consumer of gas is supplied with gas stoves for cooking and very many with stoves for heating.

In Calais not more than 400 are in use, and at Dunkirk the same number.

At Boulogne-sur-Mer and the towns of the north they are growing in favor. The cost of fuel and its rise in price have favorably affected this branch of the gas interest. The vendors of gas stoves have found ready listeners when they inveighed upon their advantage over fireplaces burning wood or coal at loss of so much heat driven up the chimney, and enlarged upon the price of soft coals, which have cost us from 50 to 58 francs per ton.

WAGES AND HOURS OF LABOR.

The wages paid for stokers at this place are 5.50 francs ($1.06) per day of twelve hours. Laborers about 4 francs (78 cents). The stokers have a gratuity allowed to them at the end of the month amounting to 3 cents per day, but this is optional with their employer, and given as a reward of merit. The greatest number in winter of the force of a company at Rouen, manufacturing about 160,000,000 cubic feet of gas, consists of about 250 men in and out of the works, and manufacturing briquettes, ammoniacal salts, etc. The hours of labor are twelve, and four charges are put into the retorts every twenty-four hours.

MATERIAL USED.

Although gas can be produced from most inflammable substances, experience has demonstrated that coal, and especially coal burning with much flame, furnishes the best material at the least cost for making a reliable gas. It is generally used in France, and the exception is found in a few private gas works, where the distillation from heavy oils is still carried on. The coal area of Europe is estimated as follows, in square kilometers:*

England	3,000
France	2,600
Prussia	2,500
Belgium	1,250
Bohemia	1,600
Westphalia	900
Spain	550
Russia	250

France extracts coal from mines scattered over a large number of departments.

*Kilometer equals five-eighths of a mile.

Output of the coal mines of France in 1886.

Mines.	Production.	Mines.	Production.
	Tons.		*Tons.*
North and of Pas-de-Calais	8,398,689	Decize	217,851
Saint-Étienne	8,542,219	Romechamp	184,546
Alais	2,050,758	Ahun	164,790
Creuzot and Blansy	1,119,675	Épinac and d'Aubigny	131,974
Commentry and Doyot	831,759	Saint-Éloi	130,000
Aubin	666,045	Le Drac (anthracite)	105,000
Aix en Provence (lignite)	460,487	Anthracite, coal, lignites	622,694
Carmaux	306,879		
Brassac	250,799	Total	19,412,112
Graissessac	227,851		

The concessions to the coal companies consist of about 1,100,000 acres, of which about 750,000 acres could be termed coal lands, while the remainder produces peat, lignites, etc. About 800,000 tons of coal are used to supply the gas for Paris and 3,000,000 tons for the rest of France. The average thickness of the coal beds worked in France varies from 13 to 20 feet; there are exceptions to this rule, as in Avignon a bed of 98 feet is found. The product of coal from the French mines during the year 1888 was 22,603,000 tons, the increase for the year 1889, although returns are incomplete, is estimated at about 2,000,000 tons. The amount of foreign coal used is about 10,000,000 tons. Allowing for the increasing consumption of each year, the above estimate would indicate that the supply of coal in Europe would not be exhausted in less than 25,000 years. Coals are classified in regard to their value to the gas-maker.

Lignite or brown coal is of little value. It is found saturated with moisture, which it retains with great tenacity, and in distillation gives off much water more or less charged with acetic acid, with but little gas, of low illuminating power, and of an unpleasant odor, and a small quantity of tar, and the coke left behind is almost valueless as fuel.

Caking coal.—The Newcastle would come under the head of caking coal. This coal derives its name from the fact that when heated, it breaks into small fragments which subsequently undergo a kind of fusion and become agglomerated into a compact mass. It is a favorite household coal in this part of France, although when burned in an ordinary grate it requires much stirring to prevent caking. It gives off much gaseous matter, and although the coke produced is rather soft, it is of excellent quality. This coal is considered advantageous when mixed with the coals of the Pas-de-Calais both in the returns of gas and coke.

Cannel coal.—The name of this coal is obviously a corruption of the word candle, it having formerly been used by the poor in Lancashire for the same purpose as candles. It is sometimes called parrot coal, for the chattering noise it keeps up in burning. It is hard, compact, and lustrous, and has been cut into ornamental inkstanks, plates, beads, etc. It varies in color from brown to black.

The boghead coal is one of the best varieties, and is extensively used for mixing with the French coal, even in Calais and other parts of the coal-producing department of the Pas-de-Calais.

This cannel coal of best quality has produced 15,000 cubic feet of gas per ton of 37.75 candle power and 708 pounds of coke.

Pas-de-Calais coal beds.—The coal beds formed in the department of the Pas-de-Calais in this consular district are connected with Belgium and Westphalia on one side and with Somersetshire on the other, and this accounts for the comparatively slight difference between the English coal and that which is found in northern continental Europe.

Gas managers are reticent upon their business, rightly deeming that secrecy is all important in their business and no details are officially required from them. Very few treatises upon the employment and manufacture of illuminating gas exist, and the conveyance of information until recently has been rather oral than written and confined to comparatively few persons. The European works are mostly of ancient date. Those of S. Clegg, of England, and of Pelouse & Harcourt, of France, and not to omit that of M. D. Magnièr, published in 1849, are still consulted and considered authorities on many points. Dr. Schilling, of Germany, in his second edition, dates as far back as 1879. I have consulted all of these works, and am indebted for information to these authorities, as well as to the more modern works of King, of England, and Borias, of France, the latter just published, while the facts contained in the former were collected between the years 1876 and 1882. The study of these works, with which undoubtedly the gas engineers of our country are familiar, enabled me to understand the practical working of the various gas works into which I was admitted by the courtesy of Mr. Watson, who as engineer directed the reconstruction of the works at Boulogne sur-Mer as well as at Rouen, and who brought me into contact with Messieurs Coindet, Parillon, and others, so that I could obtain the details herewith transmitted, which are very incomplete. I am indebted to the consular agents of this district for many details of the gas industry in their respective agencies.

CHAS. P. WILLIAMS,
Consul.

UNITED STATES CONSULATE,
Rouen, May 28, 1890.

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PARIS.

REPORT BY CONSUL-GENERAL RATHBONE.

Names, locations, and populations of cities using gas and names of gas companies, consular district of Paris.

Name of city or town.	Department.	Population.	Name of company or of
Paris	Seine	2,341,550	Compagnie Parisienne rage et de chauffage gaz.
Towns, villages, and roads in the vicinity of Paris.	....do	616,539	17 establishments.
Bourges	Cher	42,829	Bergeron.
Vierzon	....do	10,500	Laurent.
Chartres	Eure-et-Loir	22,000	Cie. Centrale.
Dreux	....do	8,719	Peuillot.
Châteaudun	....do	7,284	Mayoux.
Bonneval	....do	3,631	Fusion des gas.
Anet	....do	1,446	Bonhout.
Blois	Loir-et-Cher	24,000	Cie. Française du cent midi.
Vendôme	....do	7,323	Bergeot.
Romarantin	....do	7,455	Marian.
Montrichard	....do	3,025	Bailleux.
Orléans	Loiret	70,000	Fauconnier.
Montargis	....do	10,994	Bedos.
Briare	....do	5,894	Bapterosses.
Pithiviers	....do	5,509	Mallet.
Beauvais	Oise	18,441	Alavoine.
Compiègne	....do	14,375	Cie. du gaz.
Creil and Chantilly	....do	11,574	Cie. Française.
Senlis	....do	7,127	Société gaz du nord.
Noyon	....do	6,200	Marie Rivery.
Clermont	....do	5,529	Cie. Française.
Meru	....do	4,344	Société anonyme.
Crepy	....do	3,625	Société anonyme.
Mouy	....do	3,273	Jérôme.
Noailles	....do	3,158	George & Co.
Berteuil	....do	3,154	Echeilbreuner.
St. Just	....do	2,488	Lesobre.
Nevers	Nièvre	25,006	Roche.
Cosne	....do	7,790	Vve. Legrand.
Clamecy	....do	5,307	Neuville.
Delize	....do	5,101	Cabassut.
Lo Charité	....do	5,453	Quenlin.
Pongues	....do	1,564	Couturier.
Le Mans	Sarthe	57,591	Seguin.
La Flèche	....do	9,841	Société anonyme.
Mamers	....do	6,478	Bremont.
Sablé	....do	6,183	Vilain.
Ferté Bernard	....do	5,688	Simier.
Ecoumoy	....do	3,709	Dupont.
Saint Calais	....do	3,671	Gauthier.
Chateau du Loir	....do	3,611	Bonamy & Bertin.
Fontainebleau	Seine-et-Marne	13,340	Leroy.
Meleus	....do	12,564	Poncart.
Meaux	....do	12,291	Cie. Continentale.
Provins	....do	8,240	Cie. Générale.
Montereau	....do	7,709	Cie. Française.
Lagny	....do	4,990	Dury.
Versailles	....do	49,852	Société anonyme.
St. Germain	....do	16,312	Do.
Argenteuil	....do	12,809	Hugon & Co.
Montmorency and vicinity	....do	10,000	Cie. Parisienne.
Étampes	....do	8,461	Cie. Générale.
Sevrés	....do	7,620	Société anonyme.
Corbeil	....do	7,541	Bigler & Co.
Pontoise	....do	7,192	Bénard.
Mantes	....do	6,607	Grignon & Co.
Poissy	....do	6,403	Foucart.
Rambouillet	....do	5,033	Société anonyme.
Magny	....do	2,036	Pelas.
Auxerre	Yonne	17,456	Cie. Française.
Sens	....do	14,035	Couturier.
Joigny	....do	6,494	Cie. Parisienne.
Tonnerre	....do	5,095	Cie. Française.
Brienon	....do	2,626	Stucker.

In 1888 there were for all France 1,001 cities, with a populat 12,680,000, using gas. Their number in 1872 was 550 only, with a *ulation of 8,757,000.*

MONEY INVESTED.

The gas company, known under the name of Compagnie Parisienne d'éclairage et de chauffage par le gaz, which has the sole permission to furnish the city of Paris with gas, was founded in the year 1855. The capital subscribed amounted to $16,212,000, divided into 336,000 shares at $48.25 each. These are worth now about $250.

The total receipts for the year 1889 amounted to $20,389,345, of which $15,568,372 were for gas, $3,254,036 for coke, and $682,136 for other by-products. The expense, amounting to $12,700,367, comprised $4,067,421 for coal; $842,321 for labor; $304,113 for engineers and salaried working staff; $204,171 for the central administration; $57,900 for the direction: $1,733,767 for redemption of capital; $1,310,624 for municipal charge, including the tax of 2 centimes per cubic meter.

The net profits for the year amounted to $7,623,500, of which $4,892,550 go to the stockholders, and $1,730,950 to the city of Paris. The dividend for the year was $15.

I was not able to obtain any data concerning the gas works in the provinces, these establishments being owned by private concerns.

PROCESS OF MANUFACTURE.

The gas is manufactured from coal by the ordinary process, and is assayed every day before delivery as regards its lighting power and purification by company agents, and also by agents appointed by the city authorities.

CANDLE POWER OF GAS.

According to contract, the gas delivered for consumption by the Parisian gas company must be perfectly purified and its lighting power under a pressure from 2 to 3 millimeters of water and an average consumption of 105 liters of gas per hour, be equal to the light of a lamp burning 42 gramms of pure colza oil per hour.

ANNUAL OUTPUT.

Paris.—The report of the Paris gas company for 1889 showed that the consumption in the year amounted to 312,000,000 cubic meters (11,013,000,000 English cubic feet).

The following statements shows the annual consumption of gas in Paris:

	Cubic meters.		Cubic meters.
1879	218,813,875	1884	287,443,562
1880	244,345,324	1885	286,463,999
1881	260,926,769	1886	286,851,360
1882	275,368,705	1887	290,774,540
1883	283,864,400	1888	297,258,070

France.—The annual consumption of gas during the same period for all France was as follows:

	Cubic meters.		Cubic meters.
1879	467,500,000	1884	576,700,000
1880	507,800,000	1885	589,100,000
1881	536,200,000	1886	600,700,000
1882	560,000,000	1887	610,000,000
1883	575,000,000	1888	628,000,000

NUMBER OF CONSUMERS.

The number of subscribers to the Paris gas company for 1889 was 224,119, an increase of 11,604 over the year 1888.

The substitution of electric lighting in a number of theaters, public establishments, and thoroughfares has been compensated by the increased use of gas for domestic purposes, and the day consumption now exceeds 26 per cent of the total, and equals one-third of that in the dark hours.

PRICE OF GAS.

The Paris gas company delivers the gas used for public lighting at the rate of 83 cents per 1,000 cubic feet and for private use at the rate of $1.60 per 1,000 cubic feet.

GAS STOVE.

The apparatus which permit the use of gas in kitchens (cooking stoves, ovens, gridirons, etc.), in dressing rooms (kettles and bath heaters), in private apartments (stoves) are becoming more and more frequently used.

The fact that in Paris one fifth of the gas supplied by the gas works is consumed during the day indicates the importance of consumption other than for lighting purposes.

WAGES AND HOURS OF LABOR.

The men in charge of the furnaces are paid 65 cents per 1,000 kilograms coal; they are on duty twelve hours each day, and their daily earnings are from $2.30to $2.90. Coal carriers and cartmen are paid from 80 cents to $1 for a day's work of ten to twelve hours.

MATERIAL USED.

The coal used in the manufacture of gas by the Paris company is obtained in France, Belgium, England, and Germany at an average price of $2.90 to $3.50 per ton.

J. L. RATHBONE,
Consul-General.

UNITED STATES CONSULATE-GENERAL.

TOULON.

REPORT OF CONSULAR AGENT JOUVE.

Population of Toulon: 71,000.

Name of gas company: Joint Stock Company for Gaslighting at Toulon.

Amount of money invested in the industry: 2,875,000 francs.

Process of manufacture: Distilation in gazogene ovens (system Echelbrumer.)

Candle power of gas: 104 liters gas giving a light equal to one Carcel lamp using 42 grains pure colza oil an hour (the same conditions for the city of Paris).

Annual output: 2,530,000 cubic meters.

Number of consumers: 1,700.

Price of gas per 1,000 cubic feet: 32.76 centimes per cubic meter.

Wages of employes and hours of labor: Stokers receive 4.25 francs for ten hours' work.

Material used in the manufacture of gas: Newcastle and St. Étienne (Firmimy and Moutrambert) coals; different prices, from 30 to 37 francs delivered at works.

W. N. JOUVE,
Consular Agent.

UNITED STATES CONSULAR AGENCY,
Toulon, May 19, 1890.

RHEIMS DISTRICT.

REPORT BY CONSUL KEEDY.

The information desired and asked for in your circular of February 15, 1890, being of such a character, I have after much care prepared and arranged it in the following tabular form, according to the eight departments of my consular district, in order to facilitate examination and reference:

DEPARTMENT OF AISNE.

Cities.	Inhabitants.	Company.	Value invested.	Process of manufacture.	Candle power.	Annual consumption.	No. of consumers.	Price per 1,000 cubic feet.	Per cent for heating and cooking.	Wages of employés, per day.	Hours of labor.	Material used.	Price at gas works.
			Francs.			*Cubic feet.*		*Frcs.*		*Frcs.*			
Anizy le Château	1,217	Mr. T. Bengel, proprietor	55,000	Distillation of coal	8	679,920	41	11.30	12	4.50	12	Anthracite coal	0.15
Bohain	7,000	Société locative de Bohain	60,000	do	8	7,082,500	200	8.50	22	4.00	10	do	.15
La Chapelle en Thiérache.	2,603	Ch. de Rivery & Co., proprietors.	60,000	do	7	720,000	56	11.30	15	4.50	12	do	.18
Château Thierry	6,902	Mr. A. Fleury & Co., proprietors.	250,000	do	12	4,150,684	180	8.50	3	4.00	12	do	.10
Chauny	9,052	Gérardin & Co., proprietors	280,000	do	10	22,750,000	238	8.50	10	4.50	12	do	.12
Fère en Tardenois	2,397	Leroy Dupré, proprietors	65,000	do	8	810,000	63	11.30	12	4.50	12	do	.16
La Fère	4,951	Girrer & Co	88,000	do	10	1,750,000	117	8.75	10	4.00	10	do	.14
Fresnoy le Grand	3,706	Compagnie d'éclairage et de chauffage par le gaz.	100,000	do	12	1,274,850	78	8.50	15	4.00	12	do	.15
Guise	7,677	Compagnie française de chauffage et d'éclairage par le gaz.	245,000	do	10	4,325,000	192	10.50	12	3.50	12	do	.12
Hirson	5,743	do	175,000	do	10	3,751,500	142	10.50	12	3.50	12	do	.12
Laon	13,698	Compagnie d'éclairage des villes de Laon et Vervins.	500,000	do	14	35,500,000	510	8.50	14	5.00	14	do	.14
Marle	2,404	Société d'éclairage de Marle	60,000	do	10	815,000	65	11.30	15	4.00	12	do	.14
Le Nouvion	3,334	Ch. de Rivery & Co., proprietors	75,000	do	7	930,500	69	11.30	10	4.00	10	do	.18
Origny	2,472	Société anonyme du gaz d'Origny	40,100	do	8	100,000	80	10.00	18	3.50	12	do	.22
St. Quentin	47,353	Société anonyme du gaz de St. Quentin.	1,750,000	do	12	11,275,700	2,000	8.50	10	4.50	12	do	.13
Ribemont	3,200	Société anonyme du gaz de Ribemont.	75,000	do	18	75,000	103	8.50	17	3.00	10	do	.15
Soissons	11,850	Société anonyme des usines à gaz du nord et de l'est.	400,000	do	10	9,870,000	275	8.50	12	4.50	12	do	.14
Tergnier	4,000	Société anonyme du gaz de Tergnier.	80,000	do	8	1,600,000	148	10.00	10	4.00	12	do	.15
Vervins	3,215	Compagnie d'éclairage des villes de Laon et Vervins.	110,000	do	14	8,750,000	145	8.50	15	4.50	14	do	.14
Villers-Cotterets	3,811	Société locale de Villers-Cotterets.	75,000	do	8	1,225,000	126	10.50	6	4.00	12	do	.15

DEPARTMENT OF ARDENNES.

Bogny	863	Supplied from Château Regnault.	.....	Distillation of coal	8	406,700	35	8.50	12	.....	....	Anthracite coal	.14
Braux	2,854	.....do	.....	.....do	8	875,300	82	8.50	12	.....	....	....do	.14
Charleville	16,185	Compagnie française de chauffage et d'éclairage par le gaz.	90,000	.....do	10	38,875,000	2,151	8.50	18	4.50	12	....do	.12
Château Regnault	2,085	Société gazière des Ardennes	304,000	.....do	8	818,500	83	8.50	12	4.00	10	....do	.14
Givet	7,820	Compagnie française de chauffage et d'éclairage par le gaz.	88,000	.....do	7	1,878,500	176	11.30	15	3.50	12	....do	.12
Levrézy	750	Supplied from Château Regnault.	.....	.....do	8	392,000	31	8.50	12	.....	....	....do	.12
Mézières	6,674	Supplied from Charleville	.....	.....do	10	1,750,000	182	8.50	18	.....	....	....do	.12
Mohon	2,877	Compagnie française de chauffage et d'éclairage par le gaz.	25,000	.....do	7	1,075,000	106	11.30	15	4.50	12	....do	.14
Monthermé	3,383	Supplied from Château Regnault.	.....	.....do	8	1,382,000	133	8.50	12	.....	....	....do	.12
Nouzon	7,069	Mr. Detombay, proprietor	45,000	.....do	9	2,750,000	238	10.50	15	4.00	10	....do	.15
Rennes	2,000	Poncelet Guyot, proprietor	15,000	Distillation of schiste and petroleum.	12	170,000	32	35.41	12	5.00	12	Schiste and petroleum.	.95
Rethel	7,452	Société anonyme des usines à gaz du nord et de l'est.	62,000	Distillation of coal	10	2,875,000	272	8.50	12	4.50	12	Anthracite coal	.12
Revin	4,027	Mr. Hacart, proprietor	38,000	.....do	9	872,500	83	8.50	18	4.50	12	....do	.12
Sedan	19,306	Compagnie française de chauffage et d'éclairage par le gaz.	75,000	.....do	7	8,843,500	852	11.30	15	4.00	10	....do	.14
Vivier au Court	1,750	Supplied from Vrigne aux Bois	.....	.....do	8	375,500	39	10.50	17	.....	....	....do	.12
Vouziers	3,737	Société anonyme du gaz de Vouziers.	90,000	.....do	7	2,833,000	140	8.50	15	4.00	12	....do	.20
Vrigne aux Bois	2,568	Société Gazière des Ardennes	37,500	.....do	8	645,800	68	10.50	17	4.50	10	....do	.12

DEPARTMENT OF AUBE.

Arcis-sur-Aube	2,928	Compagnie anonyme d'Arcis-sur-Aube.	125,000	Distillation of coal	8	1,529,820	51	8.50	15	4.50	10	Anthracite coal	.14
Bar-sur-Aube	5,000	Mr. Monnist fils aine & Co., proprietors.	200,000	.....do	20	1,699,800	165	8.50	8	4.00	15	....do	.20
Bar-sur-Seine	3,500	Compagnie anonyme de Bar-sur-Seine.	198,000	.....do	20	793,240	140	8.50	14	4.25	14	....do	.22
Clairvaux	2,300	Société d'éclairage de Clairvaux.	40,000	.....do	7	280,000	31	11.50	10	4.00	12	....do	.20
Nogent-sur-Seine	3,650	Compagnie régionale d'éclairage au gaz.	70,000	.....do	8	875,000	158	8.75	18	4.50	10	....do	.22
Romilly	6,988	Compagnie Contin	125,000	.....do	20	1,892,500	192	8.50	25	4.00	10	....do	.20
Troyes	46,972	Compagnie locale de Troyes	850,000	.....do	12	125,575,000	1,500	10.20	24	4.50	12	....do	.18

DEPARTMENT OF HAUTE-MARNE.

Cities.	Inhabitants.	Company.	Value invested.	Process of manufacture.	Candle power.	Annual consumption.	No. of consumers.	Price per 1,000 cubic feet.	Per cent for heating and cooking.	Wages of employés per day.	Hours of labor.	Material used.	Price at gas works.
			Francs.			*Cubic feet.*		*Frcs.*		*Frcs.*			
Bourbonne les Bains.	4,475	Mr. A. Signoret, propriétaire	150,000	Distillation of coal	10	1,896,000	94	11.50	12	4.00	10	Anthracite coal	.15
Chaumont	12,852	Société anonyme des usines de gaz et de l'est.	180,000	do	12	7,850,000	615	8.75	22	4.50	12	do	.12
St.-Dizier	13,458	Vve. Rebut Boignet, proprietor	175,000	do	12	7,925,000	632	8.75	18	5.00	12	do	.11
Joinville	4,129	Société d'éclairage de Joinville	77,000	do	8	1,750,000	89	11.50	10	4.00	10	do	.18
Langres	11,189	Mr. T. Kieffer, proprietor	150,000	do	12	6,740,000	420	8.75	15	4.50	12	do	.12
Nogent	3,422	Mr. Bénard, proprietor	80,000	do	10	1,275,000	66	11.50	10	4.25	12	do	.15
Vassy	3,720	Société locale du gaz et de l'eau	75,000	do	7	1,400,000	70	11.50	12	4.00	10	do	.15

DEPARTMENT OF MARNE.

Avize	2,425	Soc. du Gaz et des Eaux 'd Avize	140,000	Distillation of coal	6	1,558,150	53	11.30	10	5.00	12	Anthracite coal	.20
Ay	8,000	Société anonyme d'Ay	200,000	do	12	4,688,615	215	8.45	12	4.00	12	do	15
Bazancourt*													
Châlons s. Marne.	23,648	Société anonyme des Usines à Gaz du Nord et de l'Est.	450,000	Distillation of coal	8	11,790,000	712	8.75	15	4.50	12	Anthracite coal	12
Dizy Magenta	1,989	Supplied from Ay		do	12	1,330,000	54	8.45	12			do	15
Dormans	2,179	Mr. Tumelet, proprietor	48,000	do	10	895,000	41	11.30	7	4.00	12	do	18
Epernay	17,907	Société anonyme des Usines à Gaz du Nord et de l'Est.	350,000	do	10	9,770,000	631	8.45	18	4.50	12	do	15
Mareiul s. Ay	1,163	Supplied from Ay		do	12	980,000	43	8.45	12			do	15
Saint Memmie	937	Supplied from Châlons s. Marne		do	8	612,000	29	8.75	15			do	12
Sainte Menehould	4,644	Société locale de Ste. Menehould	65,000	do	10	1,895,500	93	10.50	20	4.00	10	do	20
Mowunelon	4,222	Société anonyme des Usines à Gaz du Nord et de l'Est.	60,000	do	8	1,345,000	86	8.75	15	4.00	12	do	15
Petit Fagnières	1,081	Supplied from Châlons		do	8	650,500	38	8.75	15			do	12
Reims	97,903	Compagnie d'éclairage et de chauffage par le gaz de la ville de Reims.	7,500,000	do	16	199,310,000	4,500	7.65	10	5.00	10	do	10
Rilly la Montagne	1,800	Société civile du Gas de Rilly la Montague, Torbon & Co.	70,000	Distillation of schist and petroleum.	32	283,300	50	36.83	2	3.50	12	Schist and petroleum.	85
Sézanne	4,500	Société anonyme à responsabilité limitée.	125,000	Distillation of coal	7	2,748,010	170	8.50	16	4.50	10	Anthracite coal	15
Vitry le François	7,670	Madame Vve. Rebut Boignet	200,000	do	10	4,620,000	212	8.50	10	4.00	10	do	15

* Works of a private individual; gas made for his own use only.

DEPARTMENT OF MEURTHE AND MOSELLE.

Baccarat	6,000	Compagnie des cristalleries de Baccarat.	48,000	Distillation of coal	10	33,996,000	300	8.50	80	4.00	12	Anthracite coal	17
Blamont	2,175	Mr. Bailly, proprietor	37,000	do	10	1,450,000	112	11.50	12	4.00	12	do	15
Briey	2,800	Campagnie française de chauffage et d'éclairage par le gas.	45,000	do	8	1,699,800	120	11.50	15	3.50	12	do	13
Champigneulles	2,350	Supplied from Nancy		do	8	1,700,000	125	11.50	12			do	15
Dombasle	2,673	Société de Varangéville Dombasle	50,000	do	8	1,890,000	175	11.50	15	4.00	12	do	15
Trouard	3,391	Supplied from Nancy		do	8	2,350,000	225	11.50	12			do	15
Jarville	2,180	do		do	8	1,500,000	158	11.50	10			do	15
Longwy	6,811	Mr. Ch. Koehler, proprietor	55,000	do	10	4,225,000	412	8.50	15	4.50	12	do	12
Lunéville	20,500	Jeanmaire frères, proprietor	120,000	do	12	10,775,000	1,000	8.50	18	4.50	12	do	12
Malzéville	2,756	Supplied from Nancy		do	8	1,750,000	172	11.50	12			do	15
Saint Max	205	do		do	8	210,000	20	11.50	10			do	15
Maxéville	2,054	do		do	8	1,330,000	132	11.50	14			do	15
Nancy	79,038	Mrs. Constantin & Co., proprietor.	3,180,000	do	8	162,875,500	4,115	8.50	24	5.00	12	do	12
St. Nicholas du Port	5,544	Usine municipale	80,000	Distillation of schist and petroleum.	12	339,960	85	38.20	20	4.50	10	Schist and petroleum.	1.00
Pompey	2,406	Supplied from Nancy		Distillation of coal	8	1,115,000	115	11.50	12			Anthracite coal	15
Pont à Mousson	11,585	Société locale de Pont à Mousson	75,000	do	10	5,225,000	515	8.50	15	4.50	12	do	12
Toul	10,500	Société locale de Toul	75,000	do	10	5,112,000	419	8.50	12	4.50	12	do	12

DEPARTMENT OF MEUSE.

Bare le Duc		Mr. E. Jeanmaire, proprietor	875,000	Distillation of coal	10	11,814,100	435	7.75	25	4.50	12	Anthracite coal	12
Commercy	18,860	Compagnie La Fusion	200,000	do	6	1,983,100	120	11.50	2	4.50	12	do	22
Etain	10,000	do	42,000	do	7	243,000	32	11.50	15	4.00	10	do	19
Signey en Barrois	2,702	do	97,000	do	7	742,500	75	8.50	12	4.50	12	do	15
St. Mikiel	4,930	Société anonyme du Gaz de St. Mikiel.	135,000	do	8	2,266,400	120	11.30	5	5.00	12	do	18
	5,000											
Stenay		Compagnie La Fusion	50,000	do	7	650,000	62	8.75	10	4.00	12	do	15
Vaucouleurs	3,206	Compagnie pour l'éclairage au Gaz de la ville de Vaucouleurs.	40,000	do	7	270,000	39	8.50	12	4.50	10	do	18
	2,726											
Verdun		Société anonyme des usines à Gas du Nord et de l'est.	220,000	do	9	10,750,500	408	7.75	8	4.50	12	do	14
	17,755											

DEPARTMENT OF VOSGES.

Cities.	Inhabitants.	Company.	Value invested.	Process of manufacture.	Candle power.	Annual consumption.	No. of consumers.	Price per 1,000 cubic feet.	Per cent for heating and cooking.	Wages of employés per day.	Hours of labor.	Material used.	Price at gas works.
			Francs.			*Cubic feet.*		*Frcs.*		*Frcs.*			
St. Dié	17,145	M. Bénard & Co., proprietor	78,000	Distillation of coal	10	10,750,000	1,112	8.50	12	4.50	12	Anthracite coal	15
Docelles	938	Mr. Merklen, proprietor	20,000	do	7	375,900	31	11.50	8	3.50	10	do	18
Epinal	20,932	Société anonyme des usines à gas du nord et de l'est.	1,300,000	do	12	22,664,000	450	7.75	14	5.00	10	do	15
Gerardmer	6,914	Mr. Signoret, proprietor	30,000	do	10	1,775,000	138	8.50	15	4.50	12	do	15
Mirecourt	5,455	Mr. Jeanmaire, proprietor	28,000	do	10	1,850,000	162	10.50	14	4.50	12	do	14
Neufchâteau	4,240	Mr. Tabouriu, proprietor	35,000	do	8	1,280,000	109	8.30	12	4.00	10	do	15
La Neuveville	1,833	Supplied from Raon l'Etape		do	8	750,000	71	11.30	15			do	13
Plombieres	2,000	Compagnie La Fusion	5,000,000	do	8	1,416,500	110	11.30	10	2.50	10	do	18
Rambervilliers	5,691	Mr. Merklen, proprietor	40,000	do	10	1,395,000	114	8.50	12	4.50	10	do	12
Raon L'Etape	3,962	Mr. Gocheskrafft, proprietor	35,000	do	12	1,228,500	131	11.30	15	4.50	12	do	13
Remiremont	8,756	Mr. Merklen, proprietor	70,000	do	10	2,747,560	238	8.50	12	4.50	12	do	12

SAMUEL H. KEEDY,
Consul.

UNITED STATES CONSULATE,
Rheims, June 9, 1890.

GERMANY.

BERLIN DISTRICT.

REPORT BY CONSUL-GENERAL EDWARDS.

INTRODUCTION.

I have the honor to submit herewith a report covering certain branches of the gas industry in the Berlin consular district.

I have included the principal cities and towns in the province of Brandenburg.

I regret to say that I have not been able to obtain any definite data in respect to the process of manufacture or the wages of employés and hours of labor. I hope to be able to furnish such information in a subsequent report.

I do not think it necessary to take up much time by going into detail on the figures submitted, but there are one or two points which I think it important to notice.

Berlin.—In the city of Berlin there are two gas companies: (1) The City Gas Company, owned and operated by the city; (2) the Imperial Continental Gas Association, owned and operated by an English company.

The former company has four separate gas works in the city. The latter company has three separate gas works in Berlin and suburbs.

It appears that privileges were granted to the English company as far back as 1827. By contract made with the town of Schönberg in 1854, this company has the exclusive right to lay pipes in that quarter of Berlin which has since been acquired from Schönberg. These privileges may to a certain extent account for the difference in price between the gas supplied by the city works and that supplied by the English company.

During the fiscal year ended March 31, 1889, there were nearly 4,000,000 cubic meters less gas used in the city of Berlin than in the preceding year. This decrease is supposed to be due to the influence of the growth of electric lighting and especially to the successful efforts of the lamp-makers in producing lamps with larger and better burners.

The number of electric lights in use in Berlin during the year ended March 31, 1889, was 66,650.

—During the calendar year 1887 the city of Berlin consumed 47,299 tons of petroleum, and in the year 1888 54,138 tons, or an increase of 15 per cent.

The quantity of gas produced by the city gas works during the year 1889 was 90,000,200 cubic meters.

The number of jets fed by the city works was: Public, 17,509; private, 798,631; gas works and bureau, 3,309; total, 819,449.

The quantity used by the public lights was 11,489,208 cubic meters; by the private lights, 68,608,759 cubic meters.

The city gas works used 314,264 tons of coal from the Silesian coal fields, the product in gas for each ton of coal being 287.05 cubic meters.

The length of the net work of pipes used by the city gas works was 693,493 meters.

The value of the gas used in gas works and bureaus was estimated at 13⅓ pfennigs per cubic meter. The value of the gas used for other purposes than lighting was estimated at 12.8 pfennigs per cubic meter. The value of the gas used for lighting was estimated at 16 pfennigs per cubic meter.

The total income of the city gas works was as follows: During the year 1889, from gas, 11,552,591.62 marks; use of gas meters, 268,323.46; cokes, tar, etc., 4,443,357.06; total, 16,264,272.14.

The total expense of the city gas works during the same year was as follows: Cost of coal, 5,614,245.88 marks; firing, 701,626; purifying material, 10,596.43; wages, 588,918.26; interest on plant, 884,270.11; other expenses, taxes, insurance, etc., 3,414,789.01; total, 11,214,445.69.

These figures show an excess of receipts over expenses of 5,049,826.45 marks.

There are no official statistical data at hand respecting the income and expenses of the English company, which supplies one-third of the gas consumed in the city of Berlin.

W. H. EDWARDS,
Consul-General.

UNITED STATES CONSULATE-GENERAL,
Berlin, May 22, 1890.

Gas industries of Berlin and Brandenburg.

City	Population.	Proprietors of gas company.	Amount of money invested.	Candle power of gas (spermaceti candle), 6 to 1 pound.
			Marks.	
Berlin	*1,527,000	Town	44,615,300	16
Stralauer-Platz				
Gitschiner-Strasse				
Müller-Strasse				
Danziger-Strasse				
Berlin, Schöneberg, and Tempelhof.		Imper. Continental-Gas-Act.-Ges., 1884.		16
Charlottenburg	*36,000	Town		17–18
Lichterfelde	*5,000	W. Baumdahl	400,000	14–15
Potsdam	‡58,000	Deutsche Contin.-Gas-Ges		15
Spandau	*30,000	Town	329,000	16–17
Brandenburg	32,400	....do	436,000	15–16
Rathenow	12,500	....do	189,000	15–16
Wriezen a. O	7,300	Schäffer & Walker	150,000	15
Neustadt-Eberswalde	‡10,600	Town	161,000	15
Prenzlau	*17,300	Allgem. Gas-Act.-Ges	222,000	15–16
Angermünde	*7,000	Schmidt & Bichel	96,000	12
Schwedt a. O	*10,000	Town	114,000	
Perleberg	*7,700	....do	102,000	12, 5
Wittenberge bei Potsdam	*10,600	Allgem. Gas-Act.-Ges	237,700	10–12
Wittstock	*6,800	Town	180,000	14
Pritzwalk	*6,100	....do		
Luckenwalde	*15,000	Contin. Gas-Act.-Ges	405,300	12
Jüterbock	*8,000	S. Elster	120,000	
Frankfurt a. O	*52,000	Deutsche Contin.-Gas-Ges	1,396,000	15
Fürsterwalde	*12,000	Town	146,400	
Landsberg a. W	*24,000	Allgem. Gas-Act.-Ges	341,000	15
Züllichau	*7,500	A. Brandrup	100,000	15
Schwiebus	‡8,500	Town	144,000	17
Luckau	5,000	Anton Berke	90,000	18
Lübben	*5,800	C. F. Schmidt	88,000	10
Guben	*26,500	Town		16
Werder	*5,500	F. Schindler	65,000	15

City.	Annual output (in 1888–'89).	Price for 1 cubic meter.	Coals used obtained from—	For heating and cooking.
	Cu. meters.	*Pfennigs.*		*Cu. mtrs.*
Berlin				
Stralauer-Platz	8,947,000	12, 8–16	Silesia	3,794,000
Gitschiner-Strasse	29,303,000			
Müller-Strasse	29,545,000			
Danziger-Strasse	22,415,000			
Berlin, Schöneberg, and Tempelhof.	30,900,000	16–18	Silesia, Westphalia, England	
Charlottenburg	2,165,000	16–18	Silesia	
Lichterfelde	202,300	16–20	....do	
Potsdam	1,896,000	15–17	Silesia and Westphalia	
Spandau	521,000	18	Westphalia	
Brandenburg	964,000	17–19	Silesia and England	
Rathenow	208,000	18–20	Westphalia and England	
Wriezens. O	109,000	20–25	Silesia and England	
Neustadt-Eberswalde	261,000	20	England	
Prenzlau	198,000	16–22	Silesia and England	3,600
Angermünde	64,500	19–22	Westphalia	
Schwedt a. O	139,000	20	England	
Perleberg	125,000	21	....do	
Wittenberge bei Potsdam	237,600	20–22, 5	Westphalia and England	1,309
Wittstock	105,300	22	....do	
Pritzwalk	86,000	21	England	
Luckenwalde	422,000	19, 5	Silesia	
Jüterbock	75,500	24, 5	....do	
Frankfurt a. O	1,402,000	13–16	....do	22,000
Fürsterwalde	265,000	16	Silesia and England	
Landsberg a. W	394,000	16–19–22	....do	19,600
Züllichau	127,000	17–21	Silesia	600
Schwiebus	102,000	19, 5	....do	
Luckau	48,300	22–25	....do	
Lübben	55,000	20–25	....do	
Guben	523,000	18–19	....do	
Werder	69,000	22, 5–25	Westphalia	

* 1885. † 1880. ‡ 1877.

CHEMNITZ.

REPORT BY CONSUL MERRITT.

The gas works of Chemnitz supply the entire city of Chemnitz together with Kappel, Schœnau, and a part of Hilbersdorf, Goblenz, and Alt. Chemnitz. The number of inhabitants is 160,000.

The city of Chemnitz owns and operates the plant.

The amount of money invested in the industry is 1,600,000 marks.

The process of manufacture is the stone-coal process.

Candle power of gas, 16 English candle power.

Approximate annual output, 7,267,830 cubic meters, 256,975,652 English cubic feet.

Number of consumers, 2,900.

Price of gas per 1,000 cubic feet, $1.22.

Heating and cooking apparatus using gas are in service, but not very extensively.

Average daily wages, 2 marks; 9 to 12 hours' work.

The material used in the manufacture of the gas is coal from Zwickau, in Saxony; 10,000 kilometers cost 160 marks.

HENRY F. MERRITT,
Consul.

UNITED STATES CONSULATE,
Chemnitz, May 19, 1890.

COLOGNE.

REPORT BY CONSUL WAMER.

Population.—The gas works of the city of Cologne are owned and worked by the city of Cologne. The population of the territory of the city of Cologne, *i. e.*, including five other smaller towns within the incorporated limits of Cologne, is 283,825, the population of the old city being 191,220. Of the total population, 229,000 come within the territory lighted by the City of Cologne Gas Works.

Gas company.—The name of the gas works is the City of Cologne Gas Works.

Capital.—According to the balance sheet of the City of Cologne Gas Works, made at the end of March 31, 1889, the total valuation of all the property is given at $1,000,000.

Process.—To this question I could not get any trustworthy answer.

Candle power.—The power of the gas is equal to 19 candles.

Output.—The annual output of gas is 771,904,637 cubic feet.

Consumers.—The number of consumers is 8,850.

Price.—The price of gas per 1,000 cubic feet is about $1.01. By an annual consumption of 883,000 cubic feet, the price is fixed at 88 cents per 1,000 cubic feet, and about 883,000 cubic feet at 81 cents per 1,000

cubic feet. For heating, cooking, and for motors the price is fixed at 81 cents per 1,000 cubic feet; by an annual consumption of 177,000 cubic feet and upwards, it is 67 cents per 1,000 cubic feet.

Gas stoves.—There are in use 1,716 cooking stoves, 1,245 heating stoves, and 240 motors.

Wages.—The City of Cologne Gas Works employ altogether 370 workmen, and the full daily working hours are ten. The daily wages of the stokers are from 83⅓ to 89⅓ cents; of the purifiers 71½ cents; of the coke coolers from 69 to 71½ cents; of the court-yard workers 59½ to 69 cents.

Material.—The material used in the manufacture of the gas is Westfalian coal from the Ruhr district, about 30 to 40 miles north of Cologne. The amount of coal used in the business year of 1888–'89—that is, from April 1, 1888, to March 31, 1889—in the manufacture of gas was 65,360 tons, which cost at the works about $2.33 per ton. According to a published statement of the disbursements and receipts of the gas works for the business year 1888–'89, the total cost of the manufacture of 1,000 cubic feet of gas was 60 cents.

In the year 1887–'88 1,000 kilograms, or 1 ton, of Westfalian coal gave the following results: Gas, cubic feet, 10,571; pure gas, cubic feet, 9,908, besides the coke, tar, and sulphide of ammonia.

The chemical composition of the gas in 1887–'88 was as follows: Sulphur, 29.07 grams per 100 cubic meters,* equal to 0.0102 vol. per cent gaseous bisulphide of carbon. Carbonic acid, highest, 1.75 vol. per cent; lowest, 1.28. On the 31st of March, 1888, the content of heavy carboretted hydrogen was 3.46 vol. per cent, equal to 1.40 vol. per cent gaseous benzine and 2.06 vol. per cent ethyl.

WM. D. WAMER,
Consul.

UNITED STATES CONSULATE,
Cologne, July 12, 1890.

CREFELD DISTRICT.

REPORT BY CONSUL BLAKE.

Cities.—There are six cities in the consular district of Crefeld where gas is manufactured and used, to wit: Crefeld Gas Fabrik, Crefeld, population, 108,000; Dülken Gas Fabrik, Dülken, population, 7,500; Gladbach Gas Fabrik, Gladbach, population, 49,000; Rheidt Gas Fabrik, Rheidt, population, 24,300; Viersen Gas Fabrik, Viersen, population, 23,000. No corporate name is given to any gas fabrik except as above stated.

Gas is manufactured from coal, but no information can be obtained as to the process of manufacture. Gas is also manufactured from par-

* One cubic meter = 35-316 cubic feet.

affin oil, which is converted into gas in red-hot cast-iron retorts. From these retorts the gas passes through a tank with pitch, water cooler, coke and cleaning apparatus into the gasometer; from this through another apparatus (sawdust, with so-called Laming's mixture) into the conduit.

No information can be obtained as to the candle power of gas.

All information is absolutely refused as to the annual output of gas.

The number of consumers of gas can not be obtained.

The price of gas is from $2.38 to $2.98 per cubic meter, except in Crefeld, where the price is $4.61 per cubic meter.

Very few gas stoves are in use for heating or cooking purposes.

The daily wages for employés is 59.2 cents, and the hours of labor vary from fourteen to eighteen per day.

Coal and paraffin oil are used in the manufacture of gas. Coal comes from Westphalia and the oil comes from the vicinity of Halle The cost of manufacturing gas, per meter, from paraffin oil is about three-fourths of a cent per cubic meter.

EVANS BLAKE,
Consul.

UNITED STATES CONSULATE,
Crefeld, August 5, 1890.

DRESDEN DISTRICT.

REPORT BY VICE-CONSUL JONES.

There are about twenty towns situated in this consular district where gas is used. They are as follows:

Towns.	Population.	Towns.	Population.
Bautzen	19,098	Gorlitz	55,
Zibbau	23,215	Penzig	3,
Loban	6,979	Hernhut	1,
Pirna	11,899	Grosseschönau	5,
Königstein	3,865	Kamenz	7,
Schandau	6,000	Riesa	7,
Radeberg	7,387	Heissen	15,
Sebnitz	7,103	Wurzen	8,
Bischofswerda	5,219	Grossenhain	11,
Pulsnitz	3,118		

The gas is manufactured by the civic authority, and is entirely under the control of this corporation.

The gas is manufactured by the usual process; no special improvement.

The average strength of the light of a burner is exactly 19, according to the method of v. Hefner, Alteneck's lamp. A single gas burner consumes 150 liters per hour. This is measured by an argand burner.

In the year 1889 the production amounted in Dresden to 20,364,6 cubic meters. Gas consumers in Dresden number only 15,000, the population being 269,000.

Gas for ordinary house-illuminating purposes costs 4¼ cents per cubic meter, with a reduction from 3 per cent to as high as 20 per cent given to the consumers according to quantities used.

Gas used for cooking and heating, besides that used for such purposes as for gas motors, house or step lighting, costs 3 cents per cubic meter. There are only 205 gas stoves used here for heating, and very few stoves used for cooking.

The day wages from 6 a. m. to 6 p. m. are as follows: For stokers, 87½ and 92½ cents; yard workers, 65 cents; earth workers or molders, 70 cents. This is for full time. The prices are fixed, and all employés are obliged to sign an agreement before entering the services of the corporation.

Coal is brought from Zwickau, Bohemia, Upper Silesia, and some from near Dresden. The cost was during 1889 from 5 to 10 pfennigs higher per 100 kilograms than during 1888. The cost of the coal for 1889 amounted to $256,000.

The facts gathered concern Dresden more than the other places, but wages are the same; and as to the price of coal, that is governed very much by the situation of the town.

JOHN D. JONES,
Deputy Consul.

UNITED STATES CONSULATE,
Dresden, May 22, 1890.

DUSSELDORF.

REPORT BY CONSUL PARTELLO.

Upon application to the officials of the gas company, which is under the direction and control of the city, I was refused the desired information for the reason stated, that it was not the wish or intention to make public information of this character. I had about given up the hope of making a report, when recently having obtained reliable information from other sources it enables me to make a short report, which please find inclosed herewith.

Dusseldorf: population 160,000.

The name of gas company is the Dusseldorf City Gas Company.

The amount of money invested in the industry is 3,200,000 marks.

The strength of the light is 17 normal German candle power, at rate of 150 liters hourly consumption of an argand burner.

The approximate annual output was 7,375,000 cubic meters in the year 1889.

Number of consumers, 3,600.

The price of gas for illuminating purposes is 16 pfennigs per cubic meter; for heating, cooking, and other purposes, 10 pfennigs per cubic meter; but persons that desire to consume gas in large quantities are given a special rate according to the quantity.

The use of gas for cooking and heating purposes was very light in quantity a few years ago, but has steadily increased. At present there are about 336 consumers for this purpose, using last year 463,000 cubic meters.

The usual hours of labor in most of the departments are twelve daily; rate of pay for such 3.30 marks; other workmen generally serve ten hours per day, and those skilled receive from 3 to 4 marks per day.

Coal is used of the ordinary kind, produced from the Westphalia coal mines on the Ruhr, very near the city. The average price last year was 11.25 marks per 1,000 kilograms, the price having of late advanced to 18.50 marks.

D. J. PARTELLO,
Consul.

UNITED STATES CONSULATE,
Dusseldorf, September 23, 1890.

FRANKFORT-ON-THE-MAIN.

REPORT BY CONSUL-GENERAL MASON.

The following report embodies such information as it has been found possible to obtain concerning the manufacture of gas in this city and in a large chemical manufactory at Höchst-on-the-Main. The statistics of other cities in this district will be found very fully set forth in the copy of Prof. Diehl's edition "Dr. Schilling's Statistical Information Concerning the Gas Manufacture in Germany, Austria, and Switzerland," which is transmitted as an inclosure with this report. This admirable work covers the entire field of inquiry, and is far more complete and trustworthy than the miscellaneous information which can be gathered by amateur investigation.

Frankfort-on-the-Main has a population of 171,000, and is supplied with gas by two principal companies, viz: the Frankfurter Gas Gesellschaft, and the Imperial Continental Gas Association, of London, an incorporated company, with $20,000,000 capital, which has gas works in various cities of Germany, Austria, Belgium, and France.

The Frankfurter company is the larger and more important of the two, and manufactures about 5,000,000 cubic meters of gas annually, which it supplies to 13,380 consumers. Reckoning the cubic meter, which is the invariable unit of gas measure in Europe, at 28.32 cubic feet, this would be an annual product of about 141,600,000 cubic feet. The average illuminating power of the gas furnished by this company is 10.5 candles for a consumption of 50 liters per hour.

The method of manufacture employed is the ordinary one of distilling coal in retort ovens, of which the company has 18 in use, 3 of the Munich pattern and 15 of the type invented by Liegel and known by his name. No rent is charged to consumers for the use of meters, which are of the "wet" type.

The prices charged by the Frankfort Company to public and private consumers are as follows: To the State and municipality for lighting public buildings, 9.14 cents per cubic meter, less discount of 10 per cent. To private consumers, 9.14 cents per cubic meter (equal to $3.26 per 1,000 cubic feet), with discounts as follows: For a yearly consumption of 4,200 cubic meters, 5 per cent; of 8,400 cubic meters, 7½ per cent; of 12,600 cubic meters, 10 per cent.

For lighting the streets and public places a long contract was made in 1885, the principal feature of which is the following gradually diminishing rate:

From 1885 to 1897, 3¾ cents per cubic meter; 1897 to 1904, 3¾ cents, 5 per cent discount; 1904 to 1911, 3¾ cents, 10 per cent discount.

Besides the price thus paid for gas, the city pays to the gas company for the use and care of street lamps, which are the property of the company, $3.90 per annum for each lantern in use. This also includes the service of lighting and extinguishing, repairs, etc.

The cost of materials used by the Frankfort Company last year averaged as follows: Saar and Westphalian coal at works, $5.25 to $7.15 per ton; Scotch cannel coal, $9.50 to $11.40 per ton; Boghead coal, $20.35 to $20.75 per ton. This combination of materials yields a heavy gas of the highest illuminating power.

Wages paid to employés are, per day, for machinist or firemen, 85 cents to $1; preparatory labor in retort furnace, $1.10 to $1.16; firemen at retorts, 95 cents; day laborer, 70 cents.

The capital invested is about $569,319. It can not be said that gas is much used in Frankfort for purposes of cooking and heating. Gas stoves and radiators, mostly of American and English patterns, have been introduced and used to some extent, but at $3.26 per 1,000 feet gas would be too costly for any general use as fuel. Such as is used for cooking and heating is supplied through the ordinary service meters, so that it is impossible to give any precise statistics as to its quantity.

The Imperial Continental Gas Association has, as already stated, extensive gas works here, and competes openly with the Frankfort company for the patronage of private consumers. Each company pays to the municipality an annual tax amounting to about $20,000. The Imperial Association, called familiarly "The English Gas Company," made last year 9,000,000 meters of gas, the average illuminating power of which was 11½ candles for a bat-wing burner consuming 4 feet per hour and 17 candles for a London Argand burner using 5 feet per hour. The process used is the same as that of its rival the Frankfurter company, and no material is employed except Westphalian and British coals. The company supplies 9,500 customers and its schedule of prices is as follows: For gas consumed in street lamps, 1½ cents per cubic meter, or 53 cents per 1,000 cubic feet, besides which the city pays, for lighting, cleaning, and repairing, 32 cents per month for each lantern supplied by the company. For lighting municipal and state buildings

the rate is $1.41 per 1,000 cubic feet, less a discount of 10 per cent. Private consumers are supplied at the same rate, that is, $1.41 per 1,000 cubic feet, with discounts as follows: For customers taking 10,000 cubic meters, 5 per cent; 20,000 cubic meters, 7½ per cent; 30,000 cubic meters, 10 per cent. Wages paid at the works of this company are the same as those already stated for the Frankfort Company, and range from 60 cents to $1.10 per day. It will be noticed that there is a difference of about 100 per cent. in the price per cubic meter charged by the two foregoing companies to the several classes of consumers. This results from the notable difference in the weight and illuminating value of the gases manufactured by the two companies, respectively. The English company, on the one hand, furnishes a light, brilliant gas of such standard that 113 cubic feet have the same illuminating power as only 50 feet of the heavy,rich gas supplied by the Frankfort company. The difference of price represents the difference between the two different grades of gas that they supply, nothing more.

Besides municipal gas companies, there are in this district several large manufacturing establishments which make their own gas, which is not only used for illuminating their works and offices, but the homes of their working people and even the streets and public buildings of the towns in which they are located. As a typical example of this kind may be cited the Aniline Color Works of Messrs. Meiste & Lucius at Höchst, a town of 7,225 inhabitants, situated on the Main a few miles below Frankfort. This company makes daily in winter about 10,000 cubic meters of gas, which is reduced to 6,000 meters per day in summer. It is of a rather low grade, the average being of 10-candle power, and is furnished at the very moderate rate of 1 cent per cubic meter, equal to about 35½ cents per 1,000 feet. The company uses directly the subsidiary products, and it is found that, credit for these being given, the price above quoted pays the cost of production with 5 per cent interest on the capital employed and 10 per cent annually toward the sinking fund. The apparatus used is the Chamotte retort, which is mounted in batteries of nine in each oven. From the retorts the gas is drawn through the "scrubber" and purified with sawdust and oxide of iron. The material used is Westphalian coal, which costs under present contract $3.52 per ton at the works and yields 988 cubic feet of gas per 100 kilometers, equal to 220 pounds or nearly 10,000 feet per ton.

These are perhaps the minimum figures attainable in this part of Germany for the manufacture of a gas of very ordinary quality, which made and used as a measure of economy and not as a source of profit.

FRANK H. MASON,
Consul-General.

UNITED STATES CONSULATE GENERAL,
Frankfort, June 3, 1890.

HAMBURG DISTRICT.

(1. Hamburg; 2. Altona; 3. Wandsbek; 4. Kiel; 5. Rendsburg; 6. Harburg; 7. Lüneburg; 8. Rostock; 9. Stade; 10. Cuxhaven.)

REPORT BY CONSUL JOHNSON.

In obedience to the Department's circular of February 15, 1890, I addressed the following gas companies, as the most important ones in my district, requesting information on and replies to the several points given in the above circular, viz, Hamburg, Altona, Wandsbek, Lübeck, Kiel, Schleswig, Rendsburg, Flensburg, Harburg, Schwerin, Lüneburg, Rostock, Stade, and Cuxhaven.

Most of these companies have been very dilatory in sending replies, whereas four of them, Lübeck, Schleswig, Flensburg, and Schwerin, have up to date not seen fit to reply at all. Others again, especially the Hamburg company, have partially refused to answer certain interrogatories.

I give such information as I have been able to obtain from each company separately in the above order.

1. HAMBURG.

The Direction der Gaswerke, as the company is called, is virtually under the control of the city, seven-eighths of the profits going to the city and the remaining eighth to the so-called lessee, who is a private individual.

The company owns two works, one in Barmbeck, a suburb of Hamburg, and the principal one in the city, which is situated directly on the water front of the Elbe. The gas is generated from English coals and on the average has a candle power of 14 sperm candles. The approximate annual output is 1,284,478,000 cubic feet, the number of consumers about 25,000 in a population of about 480,000.

The price for private and public buildings is about 5.09 marks per 1,000 cubic feet; for gas motors, about 4.24 marks per 1,000 cubic feet; and about 2.83 marks per 1,000 cubic feet for street lighting. A great many public buildings and private houses have two gas lamps, one on either side of the chief entrance. The city pays for the gas consumed by one of these. No exact record is kept of the gas stoves for heating and cooking, as the gas consumed by these is paid for at the same rate as that for lighting in private dwellings.

The wages paid the laborers and other employés are as follows: Common laborers, 3.50; head laborers, 3.80; weighers, 4.10; lamplighters, 3; head lighters, 3.12 marks per day; lamplighter inspectors, 1,300 to 1,600 marks per annum; assistant mechanics, 3.50 marks per day; mechanics, 25 marks per week; head mechanics, 1,400 marks per annum; gas-meter inspectors, 1,300 to 1,800 marks per annum. Ten hours a day is the time of labor.

Following the general labor movement, all of the employés, with the exception of the lamplighters, some three weeks ago, combined and

struck for higher wages and eight hours labor. Their demands, however, were not acceded to, and the consequence was that the supply of gas gave out, leaving the city in total darkness for about thirty-six hours. The company, however, very promptly succeeded in engaging new laborers at the old wages and on the former conditions.

As far as I could learn the material used is English coal. The colliers carrying the coal from England land their cargoes at the works without transshipment, which must materially reduce the cost.

2. ALTONA.

The company in this city is called the Gas- und Wasser-Gesellschaft in Altona, is a stock company, and as its name signifies, also directs the water supply of Altona with its suburb Ottensen.

The process of manufacture is the same as that in the United States, perhaps with the one exception that the retort-ovens are not heated directly with coke. Carbonic oxide is first produced from the fuel and conducted into the retort ovens, where it is converted into carbonic acid and nitrogen by means of additional and previously heated air. This process with so-called generator-ovens is also, but not yet generally, employed in the United States, and is claimed to be very advantageous.

The company contracts to furnish 14 candle power in a street lamp burner (bat's wing) consuming 5 cubic feet per hour; the candle power derived, however, is higher.

In 1889 the output was 164,851,000 cubic feet. At present the number of consumers is 2,668; 70 of these use gas motors. The price per 1,000 cubic feet is 5.66 marks, with a rebate of 20 per cent if the gas is used for motors.

The aggregate amount of wages paid in 1889 to the employés (not including technical and mercantile officials) was 162,108 marks. The wages are as follows: The chief inspector of works, exclusive of dwelling, fuel, light, and water, 2,400 marks per annum; the overseer, 1,560 marks per annum; retort foremen, for 7 days or 7 nights, 35 marks per week; stokers, 33; engineers, 31; skilled laborers, 4 marks per day; unskilled laborers, 3.20 marks per day. The employés work from 6 a. m. to 6 p. m., during which time they are not permitted to leave the works. During this time, however, they are allowed two and a half hours in all for lunch, dinner, and supper. The laborers also work from 6 a. m. to 6 p. m., but are allowed to go home at midday, having two hours' rest in all.

The amount invested in the gas industry alone is 2,635,000 marks.

Very few gas stoves are known to be in use at Altona.

English coal (Durham) is principally employed; Bohemian, Scotch, and Kentucky cannel coal is intermixed with the former to enhance the candle power. The latter quality has not proved advantageous. English coal delivered at the works now costs 19.60 marks per ton; Bohemian and Scotch cannel, 35 marks per ton. The gas works of this company are also situated on the river front of the Elbe, and it is there-

fore reasonable to suppose that the prices paid for coal by the Hamburg works will be about the same.

Altona, with its suburbs, has a population of about 120,000.

3. WANDSBEK.

The information received from Wandsbek, a town of 17,000 inhabitants, close to Hamburg, is meager and is as follows:

Name of gas company, Städtische Gasanstalt.

Process of manufacture, generation of gas from English coal.

Candle power of gas, 12 to 14.

Approximate annual output, 900,000 cubic meters.

Number of consumers, 500.

Price of gas, 18 pfennigs per cubic meter and 14 pfennigs per cubic meter for motors.

Wages of employés and hours of labor: stokers, 3.80 marks per day; laborers, 3.25 marks per day. Twelve hours labor a day.

The use of gas stoves for heating and cooking is insignificant.

Material used in manufacture of gas, where obtained, and price at the gas works: English coal imported from London, costing 3.50 marks per 200 pounds, delivered at the works.

4. KIEL.

Kiel, the German naval port of the Baltic, has about 50,000 inhabitants. The name of its gas company is Städtisches Gaswerk, Kiél.

The gas is generated from coal and shows 18 candle-power. The approximate annual output is 3,000,000 cubic meters and the number of consumers about 1,200.

The price is 20 pfennigs per cubic meter for illuminating purposes and 16 pfennigs per cubic meter for motor and cooking purposes, with the following discounts:

Annual consumption.	Discount.	Annual consumption.	Discount.
Cubic meter.	*Per cent.*	*Cubic meter.*	*Per cent.*
10,000–15,000	3	45,001–60,000	12
15,001–20,000	4	60,001–75,000	14
20,001–25,000	6	75,001–100,000	18
25,001–30,000	8	over 100,000	20
30,001–45,000	10		

The capital stock of the company is 1,200,000 marks.

Wages of employés and hours of labor: Master workmen, 1,500 to 1,800 marks per annum, including lodging, fuel, and light. Foremen, 3.50 to 4 marks per day; stokers, 3 to 3.30; skilled laborers, 3.20 to 3.60; unskilled laborers, 2.70 to 3.10; seven days or 84 hours a week.

Various systems of gas stoves are used.

The following three kinds of coal are employed: (1) Newcastle gas coal, price free on board Tyne Dock, Newcastle, 15 shillings per ton;

freight, carriage, and weighing, about 7.90 marks per ton. (2) Cannel coal, brand Leven Boghead, bought at Kiel for 3 marks per ton (3 marks per hectoliter is probably meant). (3) Cleansing or purifying mass from Fredk. Lux, Ludwigshafen-on-the-Rhine, costing 235 marks per 10,000 kilograms delivered at works.

5. RENDSBURG.

Population, about 15,000. Name of gas company, Gaswerke Stadt Rendsburg.

Process of manufacture; generation of coal gas.

Candle power of gas, 16.5 to 17; approximate annual output, 450,000 cubic meters.

Number of consumers, 450. Price of gas, 5.04 marks per 1,000 cubic feet.

Discounts, annual consumption: 400 to 2,000 cubic meters, 1 pfennig per cubic meter; 2,000 to 5,000 cubic meters, 1½ pfennigs per cubic meter; over 5,000 cubic meters, 2 pfennigs, per cubic meter.

Wages of employés and hours of labor: Stokers, 42½ pfennigs per hour; skilled laborers, 36; unskilled laborers, 30. Hours of labor from 6 a. m. to 6 o'clock p. m. (2 hours rest for meals).

Capital of the company, 360,000 marks.

Eight gas stoves are employed for heating purposes. Material used, Newcastle coal, costing 23.75 marks per ton, delivered at the works.

6. HARBURG.

Harburg, with a population of over 20,000, is situated on the river Elbe, 6 miles south of Hamburg. Its gas works, called Gaswerk zu Harburg, are owned by the manufacturing firm of Noblie & Thörl.

Process of manufacture of the gas: generation from coal. Candle-power: 30.

Approximate annual output, 27,000,000 cubic feet.

Number of cousumers, 600. Price of gas, 7.20 marks per 1,000 cubic feet.

Wages of employés: 2.70 marks to 3.30 marks per day, 12 hours per day.

Material used: Scotch cannel coal, the price of which varies considerably.

7. LÜNEBURG.

Population, about 20,000. Name of gas company, Städtische Gasanstalt Lüneburg. Process of manufacture, generation of coal gas. Candle power, 13 to 14. Approximate annual output, 600,000 cubic meters. Number of consumers, 300. Price of gas, 19 pfennigs per cubic meter, 14½ pfennigs for street-lamps, motors, cooking and heating stoves.

Discount, over 2,500 cubic meters, one-half pfennig; over 5,000 cubic meters, 1 pfennig; over 10,000 cubic meters, 1½ pfennigs; over 20,000 *cubic meters, 2 pfennigs.*

Capital of gas company, 440,000 marks.

There are 55 gas cooking stoves and 12 gas motors in use.

The employés work from 6 to 6 o'clock and earn on an average of 2.70 marks per day.

Material used: Westphalian coal at 1.90 per hectoliter, Bohemian coal at 2.90 per hectoliter, at works.

8. Rostock.

Rostock, with 45,000 inhabitants, is a seaport of the Grand Duchy of Mecklenburg-Schwerin.

Name of its gas company, Städtische Gasanstalt der Stadt Rostock.

Process of manufacture, generation of coal gas.

Candle power, 16.

Approximate annual output, 49,600,000 cubic feet.

Number of consumers, 834.

Price of gas for illuminating, 5.38 marks per 1,000 cubic feet, and 4.25 marks per 1,000 cubic feet for ranges and stoves.

Capital of the company, 750,000 marks.

Wages and hours of labor for employés: Stokers, 2.65 marks per day of twelve hours; skilled laborers, 27 pfennings per hour, eleven hours; unskilled laborers, 20 pfennings per hour, eleven hours.

About 1,750,000 cubic feet are used for cooking, heating, and motors per annum.

Material used and price of same at works: Newcastle coal at 13.50 marks per 2,000 pounds during 1889, and at 21.50 for 1890; Scotch cannel coal and Bohemian coal are used as admixtures.

9. Stade.

Population, 10,000. Name of gas company, Städtische Gaswerk Stade.

Process of manufacture, generation of coal gas.

Candle power, 16 to 17.

Approximate annual output, 10,600,009 cubic feet.

Number of consumers, 270.

Price of gas, about 4 marks per 1,000 cubic feet for illuminating, and 3.40 marks per 1,000 cubic feet for cooking, heating, and motors.

Capital invested, 280,000 marks.

Wages of employés: Stokers, 1,000 to 1,300 marks per annum and free coke; assistant stokers, 2.50 marks per day; laborers, 2.20 to 2.40 per day; hours of labor, twelve a day, with two hours for rest.

Gas cooking stoves are extensively used and are manufactured and sold by the works at cost. Gas stoves for heating are hardly known.

Material used and price of same delivered at works: Mixture of Westphalian and Scotch cannel coal, costing 21 marks per 2,000 pounds.

10. CUXHAVEN.

Cuxhaven is situated at the mouth of the river Elbe, and has 5,000 inhabitants. Name of gas company, Cuxhavener Gas-Actien Gesellschaft.

Candle power of gas, 14 to 16.

Process of manufacture, generation of coal gas.

Approximate annual output, 900,000 cubic meters.

Number of consumers, 60.

Price of gas, 22½ pfennigs per cubic meter.

Annual consumption, over 1,000 cubic meters per annum, 5 per cent discount; over 2,000 cubic meters per annum, 10 per cent discount.

Wages of laborers, 2.75 to 3 marks per day.

Capital of company, 200,000 marks.

A few gas cooking stoves are in use (25).

Material used and price of same delivered at works, German coal, from Dortmund, costing 22 marks per 2,000 pounds.

In conclusion I will state that comparatively few gas stoves or ranges are in use in this consular district. Here and there English or American families may be found which have imported gas stoves for heating, either from England or the United States. As far as I was able to ascertain, a ready-made gas range for cooking purposes can not be purchased in Hamburg. Very many houses, however, are furnished with Bunsen bracket burners, which are attached to the wall at a height of about 3 feet from the floor and are used solely but extensively for heating or boiling water.

CHAS. F. JOHNSON,
Consul.

HAMBURG, *June 6, 1890.*

MAYENCE DISTRICT.

REPORT BY COMMERCIAL AGENT SMITH.

Cities and towns.—So far as I have been able to ascertain, the cities and towns in this consular district using gas are, Mayence, with a population of 65,852; Darmstadt, 42,794; Bingen, 7,282; Castel, 6,993, and Alzey, 5,937, in Hesse; and Wiesbaden, population 55,454; Kreuznach, population 16,414; Biebrich, 9,670, and Ruedesheim, 4,040, in Prussia. All these places have furnished me with information respecting their gas industry, except Kreuznach, which declined to do so, and Castel, which has made no reply to my inquiries.

Names of companies.—The gas works in this district are now all in the hands of the cities, except at Biebrich, on the Rhine, where they belong to a stock company, and at Alzey, where they are the property of one individual. They were formerly all managed by private companies on contracts for a term of years, twenty-five to thirty years in

length; but as these terms expired the cities got possession of the works, and are now, as a rule, operating them on their own account. At this city, Mayence, for instance, the gas works were built in 1855 by a private company, aided by the city, who were to have the operation of them for thirty years at a fixed annual rental. On the expiration of this contract, in 1885, the city took the works, paying 281,000 marks ($66,878) for all improvements made and private property in them. It cost 463,000 marks ($110,194) to construct the works at first, of which about three-fourths was met by the city and the other fourth by the company.

The gas works at Darmstadt were opened in 1855 by a private company on a twenty-five years' concession. The city got the works in 1880.

Of all the places mentioned by me, Wiesbaden has been longest in the enjoyment of gas, the works there having been opened in 1847 by a private company, which the city bought out in 1873.

Capital invested.—The amount of capital invested in the gas industry in this vicinity, as I have been able to obtain it, is as follows:

Mayence, about 1,000,000 marks ($238,000); Darmstadt, about 800,000 marks ($190,400); Bingen, 260,000 marks ($61,880); Alzey, 150,000 marks ($35,700; Wiesbaden, 1,440,000 marks ($342,720); Biebrich, 96,000 marks ($22,848); and Ruedesheim, 80,000 marks ($19,040).

With respect to the entire German Empire it is to be said that the capital employed in manufacturing gas amounts to, on the average, from 800 to 1,250 marks ($190 to $297) for every 1,000 cubic meters (35,316 cubic feet) of annual production.

Process of manufacture.—The process of manufacture is the one generally in use.

Candle power.—The candle power of the gas made is, Mayence, with a consumption of 150 liters (5.3 cubic feet) of gas hourly, 18 to 19½ German standard candles; Bingen, 15 to 16; Ruedesheim, 13½ (by a split burner); Wiesbaden, 17; and Biebrich, 16 to 18.

The German measurement is the number of candle flames 45 to 50 millimeters high (1.7 to 1.9 inches) obtained from an hourly consumption of 150 liters of gas; that is, about five English cubic feet.

Output.—The approximate annual output now is: Mayence, 3,806,000 cubic meters (134,412,696 cubic feet); Darmstadt, 1,639,489 cubic meters (57,900,193 cubic feet); Bingen, 435,300 cubic meters (15,373,054 cubic feet); Alzey, 150,000 cubic meters (5,297,400 cubic feet); Wiesbaden, 3,200,000 cubic meters (113,011,200 cubic feet); and Ruedesheim, 107,000 cubic meters (3,778,812 cubic feet).

Consumers.—The number of consumers at Mayence is put at 4,100; at Darmstadt, at 1,487; at Bingen, at 290, with a railway station in addition; at Wiesbaden, at 2,500; at Ruedesheim, at 112; at Biebrich, at 158. At Mayence two railway stations and one wagon factory make their own gas. At Darmstadt the railway manufactures its own gas.

Price.—The price of gas is reckoned here by the cubic meter (35.316

English cubic feet), and is as follows: Mayence: For illuminating purposes, 4.7 cents per cubic meter; for stoves, motors, and technical purposes, 3 cents; for public lighting, 2.1 cents. Bingen: For illuminating, 5.2 cents; motors, 4.7 cents; to large takers, less. Alzey: Average price, 5.9 cents a cubic meter. Rüdesheim: For illuminating, 5.9 cents; for stoves and motors, 2.8; for street lighting, 2.8 cents a cubic meter. Darmstadt: For street lighting, 2.4 cents; public buildings, 4.7; for cooking and heating, 3.5 cents; for illuminating purposes, 5 and 6 cents a cubic meter, according to quantity annually consumed. Wiesbaden: For illuminating, 4.7 cents; for stoves and machinery, 3.5.

Gas stoves.—Gas stoves for heating and cooking are but little used in this vicinity, as coal and wood are easily obtained from sources of supply at cheap water freights. In South Germany gas is more used for cooking and heating, I understand, than in North Germany. At Wiesbaden, with a population of about 59,000, only forty gas stoves are in use; at Bingen, only about twenty; at Rüdesheim, but three.

Wages.—The wages paid to workmen at the gas works, working in shifts of twelve hours each whenever necessary, including two hours for meals and rest, are—

Mayence: Furnace men, 76 to 90 cents a day; ordinary day laborers, 64 to 71 cents. Lamplighters receive for lighting and extinguishing street lamps, $9.50 a month, which includes a thorough cleaning three times a month of each lamp under a man's charge. Each lighter has about sixty lamps to look after.

Darmstadt: In making gas, 62 to 78 cents a day; outside workers, coal-carriers and the like, 54 to 59 cents; mechanics, 73 to 81 cents.

Bingen: Furnace men, 71 cents a day; outside workmen, 64 cents.

Alzey: $4.28 a week.

Wiesbaden: In the gas works, 71 to 90 cents a day.

Biebrich: 65 cents a day.

Material used.—In reply to this interrogatory I have to say that Mayence uses bituminous coal from the Saar mining district, and lump coal of the best kind, to which English boghead coal, up to 5 per cent, is added in winter to increase the candle power of the gas. The price formerly paid for coal was 17½ cents a centner (110 United States pounds) delivered free at the gas works, but this year 25 cents has to be paid for the same quantity, owing to a great rise in coal which has taken place since the extensive strikes of about a year ago in the coal districts. That would be $5 a ton at 2,200 pounds to the ton.

Bingen uses coal from the Saar district at $51.40 for 10 tons delivered free at works. Alzey pays $4.75 a ton, delivered at Alzey. Rüdesheim also uses Saar coal, and finds it costs when at the works, including cartage, $51.17 to $51.64 for 10 tons. Wiesbaden gets its coal principally from the government mines in the Saar district, and pays about $5 a ton for it. Darmstadt uses 82 per cent of Saar coal in the manufacture of its gas and 18 per cent of English cannel and boghead coal.

The Saar coal costs 54 cents, the English coal $1.07 a 100 kilograms (220 pounds) at the works, that is $5.40 and $10.70 respectively a ton.

Conclusion.—In addition to the information furnished above, I subjoin hereto a table, based upon statistics which appear in the last annual publication of the German Gas and Water Suppliers' Union, showing in detail the various facts of interest relating to the gas industry of Mayence, Darmstadt, Wiesbaden, and Rüdesheim, for the business year 1887–'88.

Cities.	Population.	Kind of coal used.	Amount of gas produced annually.	Average amount of gas obtained from each ton of coal.
			Cubic feet.	*Cubic feet.*
Mayence	66,000	11,424 tons* of Saar coal from Dechen I. 3,546 tons of Scotch cannel 40 tons of Australian cannel	108,851,328	4.6
Wiesbaden	56,000	9,684 tons of Saar coal from Heinitz mine	96,106,843	4.9
Darmstadt	43,000	4,547 tons of Saar coal from Heinitz mine 1,392 tons of English Tyne boghead cannel 22 tons of Hessian bitumen	57,100,694	4.8
Rüdesheim	4,200	145 tons of Saar coal from Heinitz mine 117 tons from Nordstern mine in Westphalia.	2,575,348	4.9

Cities.	Amount of gas used annually in public lighting.	Amount otherwise consumed by state and city.†	Private consumption.†		Used by gas works.†
			Altogether.	By gas motors and in technical work.	
	Cubic feet.	*Cubic feet.*	*Cubic feet.*	*Cubic feet.*	*Cubic feet.*
Mayence	19,659,973	993,756	74,680,488	15,232,073	1,760,255
Wiesbaden	14,538,926	17,690,066	53,255,539	3,099,402	1,441,628
Darmstadt	12,657,854	8,138,430	31,722,208	2,192,275	1,365,482
Rüdesheim	259,360	22,672	1,940,296	326,196	36,799

* The ton in this table is 2,000 pounds.

† These different items do not agree in a total with the annual production column because the original figures from which the reduction into cubic feet has been made do not.

Calculated in percentages the distribution is said to be as follows:

Cities.	Public consumption.	Private consumption.	Used by motors and for technical purposes.*	Consumed by gas works.	Gas lost.
Mayence	18.97	68.63	14	1.61	10.79
Wiesbaden	33.50	55.36	3.22	1.50	9.64
Darmstadt	36.42	55.55	3.84	2.39	5.64
Rüdesheim	10.96	75.35	12.56	1.42	12.27

* The private consumption includes also this item.

Gas lost.	Amount of gas supplied in 24 hours.					Largest supply in an hour.
	Average.	Largest.	Date.	Smallest.	Date.	
Cubic feet.	*Cubic feet.*	*Cubic feet.*		*Cubic feet.*		*Cubic feet.*
11,738,307	298,137	524,937	Dec. 31	134,553	July 3	78,754 on Dec. 31
9,270,167	262,962	452,362	...do	113,505	...do	64,804 on Dec. 20
3,222,055	156,026	291,357	Dec. 20	55,622	June 19	43,085 on Dec. 13
316,184	7,052	.....	Dec. 31	.....	May 8	15,962 on Dec. 25

Entire amount of coke produced.	Product for each ton of coke-giving material.	Entire amount of tar produced.	Amount from each 100 pounds of raw material.	Spirit of ammonia produced.	For each 100 pounds of material,
Tons.	*Pounds.*	*Pounds.*	*Pounds.*	*Pounds.*	*Pounds.*
7,260	1,238	1,565,927	6.62	.....	.....
6,447	1,332	1,294,717	6.7	1,714,583	8.8
3,571	1,202	882,970	7.40	1,299,964	10.9
170	1,300	26,294	5	26,296	3

Street lighting.					Price paid for gas.*			No. of meters in use.		
No. of burners at close of year.	Average amount of gas consumed hourly by each burner.	Average distance of lamps apart.		No. of street lamps attended to by one man.	Public lighting.	Private use.	Gas motors.	Wet.	Dry.	Total.
		In the city.	In the suburbs.							
	Cu. feet.	*Feet.*	*Feet.*		*Cents.*	*Cents.*	*Cents.*			
1,447	5.3	82	82 to 114	60	2¼	4.7	3.2	3,411	91	3,502
.....	.....	.....	.....	.....	3	4.7	3.5	1,527	729	2,256
1,001	5.3	108	196	50	†2.3	‡4.7–6.1	4.2	935	429	1,364
.....	.....	.....	.....	.....	5.4	8.8	6.4	52	28	80

*Per cubic meter = 35.316 English cubic feet.
†Exclusive of care of lamps.
‡According to quantity consumed.

No. of private burners according to meters.	Gas motors.		Entire length of the gas mains.	Diameter of the gas mains.		Total contents of reservoir.
	No.	Horse power.		Greatest.	Smallest.	
			Feet.	*Inches.*	*Inches.*	*Cubic feet.*
28,476	66	169.5	179,386	23.6	5.6	346,096
18,467	33	81	173 525	23.6	.....	441,450
15,845	31	72.5	159,834	17.7	.....	105,948
525	6	9	19,394	5	2.9	10,065

JAMES. H. SMITH,
Commercial Agent.

UNITED STATES COMMERCIAL AGENCY,
Mayence, July 15, 1890.

GREECE.

REPORT BY CONSUL-GENERAL SNOWDEN, OF ATHENS.

Cities using gas: Athens, Piræus, Patras, and Corfu.

Names of companies: Athens, Compagnie d'éclairage pour le gaz pour la France et l'Étranger; Siège social: Paris. Piræus: Société belge. Patras: The municipality is owner of the gas works. Corfu: English company.

Amount of money invested in the industry: Athens, 2,000,000 francs; Piræus, 1,050,000 francs; Pátras, 800,000.

The process of manufacture is by distillation of coal.

The candle power of gas is 5.16 and 10 candles, counted in carcels.

The approximate annual output can not be given.

Number of consumers: Athens, 1,400; Piræus, 350; Patras, 300.

Price of gas per 1,000 cubic feet: Athens, 37 lepta the cubic meter; * Piræus, 35; Patras, 27.

Some gas stoves used for cooking; none for heating.

Wages, 3 to 3.50 francs per day; Hours of labor, 9 to 10.

The material used in the manufacture of gas is English coal—Cardiff and Newcastle—about 35 drachmas the ton delivered in the harbor of Piræus, Corfu, or Patras.

A. LOUDON SNOWDEN,
Consul-General.

UNITED STATES CONSULATE-GENERAL,
Athens, April 22, 1890.

HOLLAND.

REPORT BY CONSUL ECKSTEIN, OF AMSTERDAM.

My personal knowledge of the matters inquired into and respecting the industry in question, not being of a character such as affording me facilities for giving anyways full or exact information upon the subject, I was obliged to make an effort to obtain from parties thoroughly familiar with it such assistance as they would feel disposed to extend to me by furnishing me necessary data and material to base a report upon.

In this endeavor I was but very partially successful, as there are but few persons to be met with or found in this city or elsewhere within my reach who are either possessed of the correct particulars regarding the different details forming the gas industry, or who, if acquainted with them, are ready or inclined to disclose or impart them to me.

The result of my investigations is herein following, communicated by furnishing answers to each of the superscribed divisions or branches composing the subject under consideration, as stated by the Department.

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* 1 drachma = 19.3 cents; 100 lepta a drachma.

CITIES AND THEIR POPULATIONS.

The following is a full and correct list of the names of all the cities and places in Holland in which gas is made and used, their location, or in which provinces situated, and their populations, viz:

Names of cities or places.	Provinces.	Population, January 1, 1889.	Names of cities or places.	Provinces.	Population, January 1, 1889.
Amsterdam	North Holland	400,000	Lochem	Gelderland	8,412
Alkmaar	do	15,229	Maassluis	South Holland	5,612
Almelo	Overyssel	8,091	Maastricht	Limburg	31,443
Amersfoort	Utrecht	15,218	Meppel	Drenthe	8,792
Apeldoorn	Gelderland	11,614	Middelburg	Zeeland	16,349
Arnhem	do	46,237	Monnikendam	North Holland	2,889
Assen	Drenthe	8,924	Nykerk	Gelderland	7,714
Barnereld	Gelderland	6,817	Nymegen	do	31,114
Bergen-op-Zoom	North Brabant	11,995	St. Oedenrode	North Brabant	4,566
Beverwyk	North Holland	4,055	Oldenzaal	Overyssel	4,230
Bodegraven	South Holland	3,690	Oosterhout	North Brabant	9,853
Bolsward	Friesland	6,055	Oud Beierland	South Holland	5,259
Breda	North Brabant	20,846	Oudenbosch	North Brabant	4,404
Brielle	South Holland	4,582	Oudewater	South Holland	2,657
Bussum	North Holland	3,164	Purmerend	North Holland	5,588
Culemborg	Gelderland	7,250	Ravenstein	North Brabant	962
Delft	South Holland	27,591	Rypde	North Holland	1,875
Deventer	Overyssel	22,750	Ryssen	Overyssel	4,625
Dieren	Gelderland	13,012	Roermond	Limburg	11,778
Doesburg	do	4,433	Rotterdam	South Holland	193,658
Doetichem	do	3,489	Roozendaal	North Brabant	10,758
Dokkum	Friesland	4,185	Schagen	North Holland	3,070
Dordrecht	South Holland	31,067	Schiedam	South Holland	25,069
Drachten	Friesland	6,141	Schoonhoven	do	4,450
Edam	North Holland	3,905	Sittard	Limburg	5,522
Eindhoven	North Brabant	4,399	Sliedrecht	South Holland	1,003
Elburg	Gelderland	2,646	Sneek	Friesland	11,319
Enkhuizen	North Holland	6,265	Sommelsdyk	South Holland	2,658
Enschedé	Overyssel	14,226	Steenbergen	North Brabant	6,835
Franeker	Friesland	6 884	Steenwyk	Overyssel	5,300
Goes	Zeeland	6,810	Tiel	Gelderland	9,737
Goor	Overyssel	2,654	Tilburg	North Brabant	32,016
Gorinchem	South Holland	11,519	Tolen	Zeeland	2,845
Gonda	do	18,847	Uithoorn	North Holland	2,080
Grave	North Brabant	2,781	Utrecht	Utrecht	81,334
Groningen	Groningen	52,996	Vechel	North Brabant	2,320
Haarlem	North Holland	49,648	Velp	Gelderland	5,995
Hague, The	South Holland	134,552	Venlo	Limburg	10,816
Harderwyk	Gelderland	6,708	Vianen	South Holland	3,659
Harlingen	Friesland	10,296	Vlaardingen	do	11,453
Heerenveen	do	3,218	Vlissingen	Zeeland	12,005
Helder and Nieuwediep.	North Holland	21,545	Waalwyk	North Brabant	4,433
			Wageningen	Gelderland	7,523
Helmond	North Brabant	5,620	Weesp	North Holland	4,296
Hengelo	Overyssel	9,476	Winschoten	Groninger	7,706
Hertogenbosch	North Brabant	26,365	Winterswyk	Gelderland	2,987
Hensden	do	1,970	Woerden	South Holland	4,468
Hilversum	North Holland	11,888	Workum	Friesland	4,229
Hoorn	do	10,943	Zaandam	North Holland	14,545
Hulst	Zeeland	2,408	Zalt-Bommel	Gelderland	3,862
Joure	Friesland	3,716	Zeist	Utrecht	6,629
Kampen	Overyssel	17,444	Zevenbergen	North Brabant	4,179
Koevorden	Drenthe	3,099	Zierikzee	Zeeland	7,162
Krommenie	North Holland	2,922	Zutphen	Gelderland	16,883
Leerdam	South Holland	3,929	Zwyndrecht	South Holland	5,008
Leeuwarden	Friesland	29,413	Zwolle	Overyssel	25,525
Lieden	South Holland	46,079			

There are, as I find, still quite a number of other places where gas is used, but they are almost mere villages, of comparatively few inhabitants.

GAS COMPANIES.

Gas companies are rare institutions in Holland.

The gas interest, as a rule, is, so to say, monopolized by or vested in the respective municipal corporations throughout the country.

They have hitherto constructed their own gas works, manufactured their own gas, and supplied it to the citizens or consumers.

To this rule there are some exceptions. For instance, the cities of Amsterdam, Haarlem, and Flushing have granted concessions for long terms of years to the Imperial Continental Gas Association to supply them with gas. The Imperial Continental Gas Association is an English company, having its main office at London, England. It was established in 1824, for the purpose of introducing lighting by gas on the continent. The company received its charter or concession from the city of Amsterdam in 1884 or 1885 for the term of thirty-two years, which will expire, I think, in 1918.

Up to the year 1885 there were two companies in operation, holding concessions from the city, namely, the one already mentioned, and besides a domestic or Dutch company, which latter's franchise, extending over thirty-five years, terminated in the year above stated and was not renewed.

If I am correctly informed there are a certain number of small towns or places supplied with gas by private individuals or companies, but whose names I have not been able to learn.

I transmit herewith a printed copy, in the Dutch language, containing stipulations of the conditions whereunder the Imperial Continental Gas Association, according to article 17 of the concession extended to it, is obliged to furnish gas to the citizens of Amsterdam. If I can obtain a copy of the concession from the city to the company or association I shall also forward it.

CAPITAL INVESTED.

If information is wanted respecting the amount of money invested in the gas industry of all the Netherlands, or within this consular district, I would be obliged to answer that it is entirely impracticable to furnish the information. It can only be said that, seeing the use of gas is so general throughout this country, the amount therein invested must be very large.

But failing to discover the existence of any published statistics or statements upon this point, and failing further, upon most diligent inquiry, as to who might be applied to as a competent party for an intelligent estimate or opinion upon the subject, I have to abandon the idea of naming any sum as representing the investment in the gas industry in Holland. I can, however, state that the nominal capital of the Imperial Continental Gas Association is about £3,800,000 sterling, and its capital embarked in their Amsterdam enterprise about 16,500,000 florins, Dutch currency.

PROCESS OF MANUFACTURE.

To be enabled and to report comprehensively upon this essential branch of the gas industry of this country would have been specially gratifying to me. To this end I made most earnest efforts to be made acquainted with the mode or process employed here in the manufacture of the article, but they proved entirely abortive. The most competent person to be met with here, and who could, if he thought proper, have supplied me with the needed information, is unquestionably the chief engineer and director of the gas works in this city. To him I applied and requested that he might impart to me the particulars touching the matter of gas-making in this city or country, and, although he is an intimate acquaintance of mine for a number of years, his reply to me upon this point, in writing, contains but the following evasive and laconic sentence: "In all Dutch towns gas is made from coals only."

To accomplish my object, if possible, I sought out the gentleman who was formerly in the employ of the Dutch Gas Company as chief engineer, and endeavored to procure the required information from him, but he also declined to favor me, by stating that he regretted to be unable to give the asked-for information, on the ground that he had been for a long time (some five years) out of active employment.

My experience in this matter furnishes only a further illustration of the strong aversion subsisting on the part of manufacturers in this country, and of all who are interested in any manufacturing establishment, to disclose at any time particulars concerning the production of any article whatsoever.

CANDLE POWER OF GAS.

From all that I can learn of the most authoritative sources of information on this point, the candle power of the gas consumed in this country varies in the different cities and towns from about 14 to 15 candles.

APPROXIMATE ANNUAL OUTPUT.

I have not succeeded in being placed in position to report the annual output of gas in this country or consular district, but have obtained the figures representing it at Amsterdam; which show that the approximate quantity of gas produced in this city in 1889 amounted to 28,500,000 cubic meters, or about 1,009,000,000 cubic feet, according to the computation of the company here.

NUMBER OF CONSUMERS.

The number of consumers of gas at Amsterdam, as stated to me by the company, is at the present time 16,939. What it amounts to for all Holland, or in this consular district, I find it impracticable to ascertain, as there are no statistics or statements published on the subject, so far as I know.

PRICE OF GAS.

According to the company's statement to me, the price of gas, as charged at Amsterdam, is 2.55 florins (about $1.02) per 1,000 cubic feet.

From what I understand, the price of gas at Amsterdam is higher than in any other city or town throughout the country; the difference in the charge for it amounting to very considerable when compared to what it is at some other cities and places.

GAS STOVES.

A prominent firm of this city, that of Messrs. Peck & Co., engaged in the sale of gas stoves, etc., has favored me with an interesting statement relating to the use of gas stoves in this country, a verbatim copy of which is the following:

The use of gas stoves in Holland has been perceptibly increasing since the last few years, *i. e.*, for heating.

For cooking gas is used to a much smaller extent, as far as cooking on regular kitchen ranges is concerned; whereas cooking burners for use in dwelling, bed, bath rooms, and pantries, etc., are largely used.

It is not at all easy to introduce the cooking-ranges for kitchen use, entirely superseding coal or any other fuel. In many cases gas is too dear; in other instances it is the difficulty we experience in trying to make people do away with the old ways they are used to.

Different local gas shows have, no doubt, greatly contributed to increase the use of stoves and burners.

A very important factor, however, is the price of gas. Towns like Utrecht, where during the last years the price of gas is decreased, can boast of a comparatively larger number of users of gas for domestic purposes than other places where gas is dearer, sometimes double the price and more, and everywhere it is distinctly noticeable that decrease of the price of gas always entails increase in domestic use of gas.

WAGES AND HOURS OF LABOR.

Concerning this important part of the gas industry, I also took special pains to put myself in possession of full and correct particulars to be herein reported, but in so doing succeeded but very indifferently.

The company here, to whom I applied for details on this point, furnished me only the following meager statement respecting it, saying:

As all classes of workmen and of several different trades are employed in gas works, their wages and hours of labor vary considerably. Stokers at Amsterdam receive 16 florins ($6.40) per week, and work about ten hours per day. Ordinary laborers are paid at the rate of 14 and 15 cents, Dutch currency (5½ and 6 cents American), per hour, and work ten and a half hours per day.

MATERIAL USED IN GAS MANUFACTURE.

At Amsterdam the material used in the manufacture of gas consists of German and English ordinary coals, which are said to cost at the gas works, at the present time, from 17 to 19 shillings (or about $4.13 to $4.62) per ton.

Scottish and Australian cannel coals are also used.

D. ECKSTEIN,
Consul.

UNITED STATES CONSULATE,
Amsterdam, April 21, 1890.

UTRECHT.

THE BURGOMASTER OF UTRECHT TO CONSUL ECKSTEIN.

[Translation.]

UTRECHT, 1890.

In answer to your esteemed missive of April 12, I have the honor to forward you the following answers to the several questions:

The gas has been supplied by the town gas works since September, 1862.

Successively for the building and the several extensions of the works up to 31st December, 1888, the sum of 2,568,609 guilders has been expended. Of this sum 2,325,808 guilders have been paid off, so that the gas works were indebted to the town on the 31st of December, 1888, only for the sum of 242,800 guilders. In consequence of a new extension, however, the amount of the debt will soon be considerably increased. Up to the present the coals have been distilled in furnaces; the new furnaces will be provided with regenerators.

The gas has on an average an illuminating power of from 14 to 15 English parliamentary candles when burning at the rate of 141.5 liters per hour.

The gas produce is on an average 26 to 27 cubic meters per 100 hectoliters of coal.

The number of consumers was on the 31st December, 1889, 5,721.

The price in 1889 was 4½ cents (Dutch currency), and on the 1st March, 1890, it was raised to 5 cents per cubic meter.

The wages of the work people vary from 10 to 20 cents (Dutch) an hour. On an average they work 10½ hours per day; they must be on the works 12 hours per day.

In general German coals are distilled.

The price per 1,000 hectoliters on the wagon at the works has gone up during the last few months from about 6 to 12 guilders (Dutch currency).

For your further information I have the honor to inclose the report of the gas works in 1888.

W. B. BOER,
Burgomaster of the town of Utrecht

Mr. D. ECKSTEIN,
Consul of the United States at Amsterdam.

ITALY.

ROME.

REPORT BY CONSUL-GENERAL BOURN.

The Anglo Romano Company for the lighting of Rome have the monopoly of supplying the city both with gas and electricity for purposes of illumination.

They have two gas works, one on the Via dei Cerchi and one on the Via Flaminia. The process described is that employed at the larger works on the Via dei Cerchi, but it is substantially the same at each.

The coal used is the Pelaumain, from New Castle, mixed with 5 per cent of Liverpool cannel coal, and costs from $6.18 to $6.37 delivered at the works. At this price the company has a contract, which has quite a time to run, though the market price has advanced to about $9.65 per ton.

The retorts used are of clay and measure 21½ inches wide, 14 inches high, and 9 feet 6 inches long. They are made in Italy, are much better than the French manufacture, and are equal to the English, but cost less. They are placed in groups of seven and eight around the furnaces. There are 78 furnaces that heat 562 retorts. Each retort has a capacity of 160 kilograms, (353 pounds), and is charged and drawn by hand.

All the furnaces are duplex, the invention of Mr. Walter R. Jones, the engineer of the works, who has secured patents on them in Europe and the United States. This pattern of furnace has been in use since 1884 and has given excellent results, all the regenerative furnaces having been transformed, in preference.

The object of the furnace is to economically produce a high temperature and to consume all coke dust, ashes, and tar when unsalable. This is done by means of two furnaces placed one above the other, named by the inventor the "duplex furnace." The separation between the two furnaces is formed by simply contracting the side walls until, at a certain height, they almost meet, thus forming a narrow slot. Under the lower furnace is a refrigerating tank. The upper furnace is open to the free exit of the large volumes of incandescent gases produced. The lower furnace is provided with five bars as in an ordinary one. An iron frame is built into the front wall of the furnace provided with three doors: (1) the top door serves for charging with fuel the upper furnace; (2) the middle door for cleaning the slot from congealed scoria; (3) and the lower door allows the removal of useless residues. These doors remain always closed save when, very rarely, one of these operations takes place. The air enters exclusively by the ash pit, which is open, passing between the fire bars and fuel which has accumulated thereon, having fallen from the slot, and here partially completes its combustion. The vitiated air then passes through the slot into the upper furnace and traversing the fuel becomes further decomposed. The final products of this combustion constitutes a large volume of gas at an exceedingly high temperature, which serves to heat the retorts for the distillation of the coal contained in them.

From this it may be seen that the contact between the fuel and the gases is prolonged so as to obtain a high degree of heat resulting from the combustion taking place in two distinct furnaces, in which the air and fuel come in contact by degrees, and just when the mutual conditions of heat and chemical composition are most favorable. In the

lower chamber the fuel is comparatively scarce, whereas the air mixtures are in excess. In the upper chambers it is just the reverse. A further advantage is the easy separation of the scoria from the mass of fuel, composed of fragments that drop continually through the slot and cool on the fire bars and hearth at the back of this furnace before falling into the ash pit, giving, therefore, all the remaining heat to the lower furnace. Hence the scoria is not, as in ordinary furnaces, a source of trouble and obstruction, nor does it require a laborious and hurtful work to eliminate it.

We have, therefore, the means of disposing of a low-grade fuel in a furnace of great simplicity and by a regular and economical function. Many of these furnaces are in operation in England, France, Belgium, Spain, and Italy, and are said to be highly appreciated. When once introduced the stokers and managers give them the preference on account of their easy working and economy.

The fuel burned in these furnaces is about 9 pounds coke, 4 pounds coke dust, and 2 pounds tar per 100 pounds of coal distilled, leaving at least 64 per cent of salable coke. The repairs are practically nothing, as the scoria repairs the furnace. The fire bars being done away with, no clinking is needed. In fact, the treatment is opposed to the existing system as no force is required, and the brickwork, instead of being knocked about, is tenderly used. The time required for the distillation of each charge in the retorts is about six hours, during which time they are at an orange color, or about 2,000° F. By this process each 1,000 kilograms (2,204.6 pounds) of coal yields about 305 cubic meters (8,630 cubic feet) of gas of about 15 candle power.

When the retorts are opened the gas in them and the ascension pipes is burned, the hydraulic main preventing the escape of any gas from other retorts.

From the ascension pipes of the retorts the gas is conducted by the hydraulic or cooling main to the condensers, which consist of three batteries of pipes, each containing 32 tubes about 25 feet long and 15 inches diameter. The hydraulic main has a trap for collecting the coal tar which condenses in it. The balance of the tar is collected in the condensers and thence conveyed to the coal-tar well.

The gas is taken from the retorts through the hydraulic main and condensers (which it leaves at the atmospheric temperature) to the scrubbers and washers, the purifiers and holders, by upright reciprocating exhausters. These exhausters have two pumps with cylinders 30 inches diameter by 24 inches stroke, and have a capacity of 60,000 cubic meters or about 78,500 cubic yards (2,119,500 cubic feet) each twenty-four hours. They were made by Hanna, Donald & Wilson, Paisley, Scotland. There is a spare vertical exhauster of 15,000 cubic meters (about 17,000 cubic yards), 459,000 cubic feet, capacity, from the same maker, and also a horizontal one with a capacity of 30,000 cub[illegible]

meters (about 34,000 cubic yards), 918,000 cubic feet. The latter was made by Artige, Paris, but does not give so good satisfaction as the vertical.

From the condensers the gas passes to the scrubbers and washers, where the ammonial gases and certain other impurities are washed out. These scrubbers are about 15 feet in diameter and 50 feet high, and were built by Messrs. C. & W. Walker, of London. Each scrubber is fitted at the base with a C. & W. Walker's patent carbonic acid and tar extracting washer, which takes out most of the tar left in the gas after condensation, and also removes a considerable quantity of the carbonic acid

The gas enters the washer by a center chamber, branching off from which are a large number of inverted troughs having perforated edges sealed in liquor. The gas passing through these perforations is deprived of its remaining tar and carbonic acid and enters the upper part of the scrubber, in which are fixed a number of tiers of 1½ by 12 inch planks placed edgeways across the scrubber and at an angle of about 45°, each tier being inclined at an opposite angle from the preceding and resting on edges cast on the scrubber side plates, and on the outlet pipe which passes down the center of the scrubber. On the enlarged upper part of one scrubber is fixed a wrought-iron wheel filled with brushwood. The water from the distributing arms falling onto this wheel is spread equally all over the area of one scrubber, and the planks below are thus kept constantly freshly wetted, and all ammonia is eliminated by the gas ascending through them.

The thorough wetting of the planks all over the scrubber being an important point in securing the entire absortion of the ammonia, Messrs. Walker have paid great attention to the even distribution of the water, and the scrubbers are fitted with their patent distributing apparatus, consisting of revolving arms having a fast and slow motion (obtained by the use of eccentric wheels). The whole is driven by vertical and horizontal shafting from a small steam engine at the foot of the scrubbers.

The water-distributing arms are fed from a supply tank fixed over the top of the scrubber, the machinery and tank being inclosed by a wrought-iron machinery room, covered in at the top. The room is surrounded by a gallery or balcony, supported on cast-iron brackets, fixed to the upper part of the scrubber, access to the gallery being obtainnd by means of a circular staircase.

The flanged joints of the scrubber plates are planed by special machinery designed for the purpose by Messrs. Walker. The plates are paneled, and while efficiency is made the first consideration, appearance is also studied, so that the scrubbers are both substantial and pleasing.

From the scrubbers and washers the gas is carried to the purifiers, to be freed from its sulphuretted hydrogen, the cyanides, and the remain-

ing carbonic acid. These consist of two rows of iron boxes, five in each row, four of which are about 14 feet square. The fifth is a check purifier 14 by 28 feet. Over each row of purifiers runs a traveling crane for the purpose of removing the covers when the boxes are to be recharged with the purifying materials. These consist of the hydrated sesquioxide of iron mixed with coarse sawdust in sufficient quantity to make the mixture porus so that the gas may pass through it without difficulty. The sesquioxide is made on the premises from scrap iron, sulphuric acid, and water, placed in leaden tanks. The iron is subjected to the action of the sulphuric acid and water until the liquor contains the proper amount of ferrous sulphate. Coarse sawdust and quick lime in powder are then thoroughly mixed, heaped up, and saturated with the ferrous sulphate solution, and allowed to remain until the reaction forming the sesquioxide has taken place. When dry, about 6 inches of this mixture of sawdust and sesquioxide of iron are placed in each tank or purifying box. The gas is carried through each tank of a row successively and then through the check purifier, entering from the bottom and passing through the porus mass. The remaining quicklime removes the carbonic acid from the the gas, and the hydrated sesquioxide of iron the sulphuretted hydrogen. By the latter decomposition ferrous sulphide and water are formed and sulphur liberated. The process may be illustrated by the following formula:

$$Fe_2O_3 + H_2S = 2FeS + S + 3H_2O$$

There are generally four tiers of sieves, which are so arranged for the use of hydrate of lime, but in the purifiers used at Rome only the lowest sieve is employed. On that is placed the mixture of sequioxide of iron, sawdust, and lime before mentioned. The sieves are of wood, 2 inches thick, and are made by special machinery, designed by Messrs. Walker. They are supported on T iron beams fixed across the purifiers, which are made in plates having planed and surfaced joints on Messrs. Walker's patented principle. The side plates have hydraulic tubes cast on, forming a water seal.

The covers are of wrought iron, having arched tops of strong plate to resist the pressure of the gas. The plates are fixed to substantial framing of T and angle iron.

The traveling crane runs on rails laid on the floor of the purifying house, and is worked by screws and gearing actuated by means of chain wheels worked by hand chains from the floor of the house. One traveler thus serves to lift the covers of any number of purifiers when fixed in line as at Rome.

The admission of gas to the purifiers is regulated by valves and connections arranged so that each purifier can be shut off at pleasure emptying and refilling. This is sometimes done by means of Messrs. Walker's patent "dry-surfaced center valves" for working four purifiers at once, or three on and one off. Patent surfaced four-way valves are

used (in several combinations) for the same purpose, but at Rome the purifiers are worked by means of double-faced slide valves 24 inches diameter. The connections are arranged so that the gas can be passed from one purifier to another, so as to give numerous combinations for the economical working up of the purifying materials.

At the Beckton Gas Works of the chartered gas company (the Gaslight and Coke Company, of London), where Messrs. Walker have erected several sets of eight purifiers 40 feet square, with valves and connections of 30-inch diameter of bore, it is found necessary to have the fullest possible control of the gas in order to secure its purification from the sulphur compounds in accordance with the requirements of the board of trade, and for this purpose complicated arrangements of connections and large numbers of valves have to be used.

The purifiers, like the scrubbers, are substantially constructed, having machine-faced joints wherever possible, and are good examples of modern practice in gas-engineering construction.

When the sesquioxide in the purifiers has combined with so much sulphur as to impair its absorbent powers it is removed from the boxes, spread to the thickness of 12 to 15 inches on the floor of an adjoining room and turned often, so as to be thoroughly exposed to the air. The ferrous sulphide absorbs oxygen from the air, and its sulphur is separated in an uncombined form. The reaction may be seen by the following formula:

$$2FeS+3O=Fe_2O_3+2S.$$

After the sesquoxide is thus revivified it may be again used until it is so thoroughly saturated with sulphur and cyanides that it ceases to be properly revivified by exposure to the air, and has heretofore been thrown away.

But in these works it is again restored by a process invented by Mr. Charles Jones and patented in Europe and the United States. As a considerable expense is saved by this process, I will describe it. Its object is to convert into activity the sesquioxide and to obtain at the same time as residues the compositions of ferric cyanide, which renders the material inert as a purifying agent.

The process is arranged as follows: The exhausted material being watered and mixed with quicklime, not exceeding 6 per cent., is collected in a heap. The heap is allowed to remain until the action is complete, which is noticeable by its change of color, owing principally to the decomposition of the sulphides and the compounds of ferric cyanide into the corresponding salts of lime. The oxide is reformed and is ready to be washed in order to remove the cyanides and sulphides in combination with the lime.

The washing may be conducted as follows. The materials are placed in a series of recipients, connected together by means of circulating pipes. Clean water is used; soft water being preferred. The circula-

tion is so arranged that one of the recipients remains free, which, after being subjected to the washing, is emptied of the material and recharged with new, and takes its place in the circuit. The washed material is now ready to be used in the purifiers.

The whole of the recipients are in communication with a reservoir to receive the washings when they have attained the necessary strength and richness of cyanides. The washings are then put into a series of boilers for condensation and evaporation. The first of the series is closed by means of a syphon containing sulphuric acid, which collects the ammonia during evaporation. The succeeding boilers are simple evaporating pans exposed to the air, from which the salts are obtained in the form of a paste, which can be at once sold or ultimately treated.

Hence there is a cheap process for the revivification of the spent purifying material by means of lime, which allows the recouperation of residues in the form of cyanides by a simple treatment of washing. The washing can be repeated several times after the material has been exposed to the action of the gas in the purifiers.

In these works there are seven gasometers of the usual form. One has a capacity of 8,000 cubic meters (about 280,000 cubic feet), and with its tank is made of iron. The others have iron holders and masonry tanks. Two have a capacity each of 6,500 cubic meters (230,000 cubic feet), and four each of 2,250 cubic meters (79,000 cubic feet).

The retorts and fire bricks when worn out or used up are broken up, reduced to powder, and mixed with new clay. From this mixture are made on the premises all the fire lumps and other clay pieces used, except the retorts and fire bricks.

The governors to regulate the pressure of gas in the various sections of the city are made by Brunt & Co., of Paris, France. There are five cone governors, four single and one double.

The consumption of coal is about 50,000 tons annually in both works.

Gas for domestic purposes is used much less in Italy than in the United States. It is so seldom used in sleeping apartments that it may be said never to be so used, and it is not generally used in other parts of the house. Candles are used for sleeping rooms and oil or petroleum for other rooms. It is seldom used in stoves for heating or cooking.

Twelve hours constitutes a day's labor, and the wages paid are about as follows: Head mechanics, per day, 96½ cents; mechanics and machinists, 67½ cents; superintendent of firemen, 96½ cents; firemen's corporal, 86⅞ cents; firemen, 77 cents.

For good conduct a bounty is given to the firemen's corporal of $1.93. A pension of $1 per week is paid to the widows of workmen so long as they remain widows. The following statement shows the capital of the company, its investments, and many details of its business for 1888 and 1889:

Capital	$2,476,850.00	
Reserve and profits	478,000.00	
		$2,954,850.00
Buildings and land	380,200.00	
Gas works	869,800.00	
Gas mains	536,900.00	
Central electrical station	206,200.00	
Electrical mains	71,900.00	
Gas services	6,600.00	
Vertical services	800.00	
Gas engines	900.00	
		2,073,300.00
Profits in 1890		390,234.00
Dividends in 1890 (October)		110,396.00
Dividends due from funds on hand		212,300.00
Total dividends from earnings		322,696.00

	1888.	1889.
Gas sold, city, cubic feet	115,650,000	121,900,900
Gas sold, private consumers, do	381,550,000	386,100,000
Number of gaslights:		
Public	6,033	6,206
Private	92,083	98,681
Number of meters	8,892	9,544
Gas mains, miles	90.72	96.93
Electric mains, do		11.63
Electric transformers, number		120
Electric lamps		7,678
Total candle power of same		167,312
Horse power of electric plant		2,700

It will be seen from this statement that in 1889 10,800,000 cubic feet of gas were sold more than in 1888. Both works, however, made but 6,000,000 more. The difference is owing to a reduction in the amount of leakage in the street pipes which has been reduced to 14 per cent. Owing to the extensive tearing up of the streets in the past it has been found as yet impossible to reduce the leakage to the aim of the company, which is from 7 to 8 per cent of the total quantity made. In 1889 both works consumed 357½ tons more coal, and sold 985 tons more coke and 272½ tons less of tar than in 1888.

The statement which follows will show the statistics for ten Italian cities, of the number and cost of the public electric, gas, and petroleum lights; the number of cubic feet of gas consumed by the public and private consumers; the cost per 100 cubic feet to each class of consumers, and the population of these cities December 31, 1887.

Illumination of cities in Italy.

	Number of public lights.			Approximate quantity of gas consumed.		Cost per 1,000 cubic feet.	
	Gas.	Electric.	Petroleum.	Public.	Private.	Public.	Private.
				Cubic feet.	*Cubic feet.*		
Rome, 1888	6,033	41	1,046	115,650,000	381,550,000	$1.36	$1.5
Naples, 1888	9,080	.....	303	137,700,000	121,200,000	1.31	1.8
Milan, 1887	3,731	128	.....	51,700,000	.....	1.09	1.4
Turin, 1887	3,920	136	352	71,600,000	59,400,000	.88	1.0
Genoa, 1887	3,348	(*)	.....	50,750,000	171,300,000	.93	1.6
Florence, 1887	3,402	.....	224	47,800,000	73,000,000	1.39	1.6
Venice, 1886-'87	3,058	†426	107	42,400,000	86,000,000	1.09	1.9
Bologna, 1887	1,800	59	.....	25,300,000	67,000,000	1.86	1.6
Palermo, 1887	2,913	16	768	60,100,000	72,000,000	1.51	2.6
Catania, 1887	1,038	‡6	576	29,950,000	.....	1.26	2.1

	City expenses for lighting.			Total.	Population Dec. 31, 1887.
	Electricity.	Gas.	Petroleum.		
Rome, 1888	$7,776	$137,790	$21,222	$166,788	382,97
Naples, 1888	.....	.....	.....	209,221	511,21
Milan, 1887	23,797	70,525	.....	94,322	330,2
Turin, 1887	30,301	83,771	10,036	124,108	256,6
Genoa, 1887	.....	49,906	.....	49,906	199,0
Florence, 1887	.....	66,674	2,911	69,585	167,8
Venice, 1886-'87	.....	.....	.....	.....	133,8
Bologna, 1887	2,702	46,706	.....	49,408	121,5
Palermo, 1887	2,258	91,868	25,993	120,119	258,9
Catania, 1887	.....	.....	.....	.....	106,6

* 60 lights are being placed. † 56 arc, 370 incandescent. ‡ 1,500-candle power.

As stated before, this company has the exclusive right to supply the city with electricity for illuminating purposes. Attached to the gas works on the via Dei Cerci is the central station, containing fourteen Babcock & Wilcox boilers of 2,700 horse power, steam engines of 2,400 horse power. Two pairs of the engines were made at Brunn, Austria, and two pairs at Gand, Belgium. The latter are built upon a modification of the Corliss system. All the engines are of the compound type. The dynamos are from Ganz & Co., Budapest, Hungary, and are constructed according to the Ganz system. The dynamos themselves constitute the balance wheels of the engines, thus dispensing with all loss by friction in transmitting power beyond the engine.

Some of the boilers have been in use four and a half years and have never had any repairs. They give perfect satisfaction.

At a meeting of the company held August 24, 1889, the managers were authorized to make certain contracts with the city for electric lighting and also with the Hydraulic Force Company. In pursuance of this authority arrangements have been made to utilize a large water power at Tivoli, about 18 miles distant. It is proposed to transmit about 2,000 horse power by electric wires to Rome. Great interest is felt in this experiment of conducting so large an amount of power for such a distance.

AUGUSTUS O. BOURN,
Consul-General.

UNITED STATES CONSULATE-GENERAL,
Rome, June 16, 1890.

CALTANISETTA.

REPORT BY CONSULAR AGENT VERDERAME, OF LICATA.

As is the case with most of the Sicilian towns, industry in Licata has not yet improved so far as to endow its population with the benefits of gas.

The neighboring town of Caltanisetta, with only 35,000 inhabitants, has been supplied with gas works since 1866 by a private firm, Messrs. A. Stefani & Co., who dispose of a capital of about $70,000. Said works consist of usual ovens, with five and seven retorts, condenser, and purifier by lime process.

The candle power is fixed as follows: A gas burner consuming 118 liters per hour is equal to a Carcel lamp, which consumes 42 grams of rape-seed oil, equal to 55 candles.

The annual output may be estimated at about 800,000 cubic feet, of which five-sixths are consumed for the town illumination at the rate of $13 per 1,000 cubic feet, and one-sixth by private persons at $23.50 per 1,000 cubic feet.

Gas stoves for heating and cooking purposes have not yet been introduced in that town, but they would certainly find a ready sale, fuel all over the island being very scarce.

The employés and laborers have salaries of 2 to 3 francs per day, and the material consumed is New Felton or Waldridge gas coal, bought in Newcastle-on-Tyne, and costing $6 to $7 per ton free of expenses at the works.

ARTHUR VERDERAME,
UNITED STATES CONSULAR AGENCY, *Consular Agent.*
Licata, April 20, 1890.

CATANIA.

REPORT OF CONSUL LAMANTIA.

The names of cities using gas in this consular district are Catania and Caltanisetta; the former has a population of 109,000, and the latter 30,000.

The name of the gas company of Catania is Compagnie Generale pour L'Eclairage a Gaz, and its headquarters are at Brussels, with a capital of 20,000,000 lire.

It was impossible to ascertain the amount of money invested in the industry, as the director thereof refused to give such information.

The process of manufacture used in the said gas works is that of Messrs. Doumas & Regnault, the same adopted in Paris and in many other European cities.

The candle power of gas is measured by the photometer, and, as per contract made with this city, it shall not surpass in its normal consume 105 liters per hour, giving a light corresponding to 7 stearic candles, or to that of one Carcel lamp, consuming 42 grams of pure olive per hour.

The approximate annual output is of 1,150,000 cubic meters.

I can not precisely give the number of consumers, but I was officially informed by the city engineer that the city of Catania consumes 850,000 cubic meters for public lights, and 300,000 are used by consumers annually.

The price of gas paid by the city, as per contract with the company, is 230 lire per 1,000 cubic meters for ordinary illumination, and 250 lire for extra illumination.

Consumers pay it at the rate of 40 centimes, or 8 cents, per cubic meter. The company thus collects 197,000 lire from the city and 12,000 lire from the consumers, a total of 209,000 lire a year. The contract with the city is for ninety years, which was stipulated in 1868.

There is no gas used for stoves, for heating, or cooking purposes.

The wages of employés range from 2 to 2.50 lire per eleven hours in a working day.

The material used in the manufacture of gas is first quality stone coal, imported from England and Scotland at the cost of 40 lire per metric ton, placed in the company's works, including municipal and customs duties.

VINCENT LAMANTIA,
Consul.

UNITED STATES CONSULATE,
Catania, Italy, May 16, 1890.

FLORENCE.

REPORT BY CONSUL DILLER.

Florence, population 179,000.

The name of the gas company is the Society Civile Illumination a Gas, with a capital invested of $400,000.

Process of manufacture: Distilled from coal.

The candle power is 14.

The approximate annual output is 205,920,000 cubic feet, divided as follows: For public use, 52,107,000; for private use, 122,100,000; loss by leakage, 31,713,000; yards of pipe, 196,830.

Number of consumers, 5,500; 3,480 public lights; 42,000 private lights.

To private parties the price is $1.82 per 1,000 cubic feet; to city, $1.66; to railroad, $1.07.

Gas stoves are not in use.

Wages average 60 cents per day of twelve hours.

Material used, bituminous and cannel coal from England; delivered at works $7 per ton.

All Tuscan cities of over 10,000 population and near railroad stations use gas.

ISAAC R. DILLER,
Consul.

UNITED STATES CONSULATE,
Florence, May 14, 1890.

GENOA.

REPORT BY CONSUL FLETCHER.

Genoa and its suburban towns, namely, Lampierdarena, Cornegliano, and Sestri Ponente. Location of gas works, Genoa. Estimated population of all above named, 220,000. Other towns in this consular district have their gas supply from local companies, but the lights thereof are very poor and hardly merit the name of gas.

The statistics given above were furnished me by Messrs. Wood and Bodle, inspectors of the Union Gas Company on the continent.

Name of gas company, Union Gas Company, London.

The company named has gas works at Alexandria, Genoa, and Milan, in Italy; at Messina in Sicily, and at Modane in France. The advertised capital invested in all these cities is in round numbers $5,000,000. No estimate can be obtained of the cost of the gas plant in Genoa. On this point the managers here are silent, remarking only that it is the company's secret and can not be discussed.

Process of manufacture: Ordinary process coal distillation.

Candle-power of gas: 7 star-candle power.

Approximate annual output: A little more than 9,000,000 cubic meters.

Number of consumers: About 10,000.

Price of gas per 1,000 cubic feet: For lighting purposes, $1.64; for heating or cooking, $1.37; special rates are given to corporations.

In this consular district the use of gas stoves, for either heating or cooking, is very limited. The people here, true to the traditions of the past, are very slow and cautious in accepting new ideas. The near future, however, promises a liberal demand for gas stoves.

Wages: Workmen receive from 48 to 77 cents per day, twelve hours constituting a day's labor for both stokers and workmen.

Material used, English coal; Newcastle on Tyne; price per ton deposited at gas works, $5.79.

JAMES FLETCHER,
Consul.

UNITED STATES CONSULATE,
Genoa, April 23, 1890.

GIRGENTI.

REPORT BY CONSULAR AGENT, BATAZZI.

In reply to your dispatch of the 8th instant, I beg to inform you that the name of the gas company of this town is: Fredrick Favier & Co.; amount invested, about 4,000 lire; process of manufacture, retorts; candle power, 13; approximate output, can not tell; number of consumers, about 50; price of gas per cubic meter, 26 centimes.

There are no gas stoves for heating or cooking in use here.

Wages of employés from 2.50 to 3 lire per day of twelve hours.

English coal is used in the manufacture of gas, the price of which I can not learn.

EUGENIO BATTAZZI,
Consular Agent.

UNITED STATES CONSULAR AGENCY,
Girgenti, April 11, 1890.

LEGHORN, CARRARA, AND MASSA.

REPORT BY CONSUL RICE.

I have the honor to inclose herewith answers to the several questions concerning the gas industry in this consular district as far as within my power; regretting, however, that I am unable to furnish answers regarding other towns, on account of their refusing to grant replies on the subject.

There appears to be a reluctance on the part of private companies to furnish statistical and correct information concerning the cost of the different industries. I have noticed this more particularly upon making inquiries concerning the manufacture of macaroni, as asked for in Department circular dated June 7, 1890.

LEGHORN.

Leghorn has 103,723 inhabitants; name of company, The J. B. Stears; capital invested, $220,000; system of manufacture, by furnaces of 7 ovens and fire bricks; every 150 quarts of gas yield 12 candle-power; output, 16,500 cubic feet per day; number of consumers, 1,200; price, from 2 to 2½ cents per cubic foot, and from 1¼ to 1¾ cents per cubic foot for government contracts. There are 50 gas engines and 150 gas stoves in the city; wages, from 85 cents to $1 per day of ten hours work, and several employés make $2 per day. Material used, Newcastle coal, which costs $6 per ton. The gas is purified with sulphate of iron and lime.

CARRARA.

Carrara has 17,811 inhabitants; name of company, Società Italiana dell' Industria del gas, Milano; capital invested, $50,000. The process in vogue is the common process from coals; output, 220,000 cubic meters; number of consumers, 1,200; illumination consisting of 386 lamps; prices, $1.55 for lighting and $1.10 for heating and cooking. Very little is used for cooking and less for heating, charcoal and firewood preferred; wages, 68 cents per day, for ten hours' work; material, English coal, costing about $8 per ton, delivered at the gas works.

MASSA.

City of Massa has 7,362 population; name of company, Società Nazionale per Gazometri ed Acquedotti; capital invested, $25,000; process, the common process from coals; output, 50,000 cubic meters; very few consumers; illumination consisting of 147 lamps; price, $1.55 for lighting and $1.10 for heating and cooking.

Very little used for heating and cooking, charcoal and firewood preferred.

Wages, 68 cents per day for ten hours' work.

Material, English coal, costing about $8 per ton delivered at the gas works.

WILLIAM T. RICE,
Consul.

UNITED STATES CONSULATE,
Leghorn, August 16, 1890.

MARSALA.

REPORT BY CONSULAR AGENT RAYSON.

Name of company, the Malta and Mediterranean Gas Company, limited; amount of money invested, 1,000,000 lire; process of manufacture, ordinary retorts; candle power of gas, 15; approximate annual output, 8,000,000 to 9,000,000 cubic feet; number of consumers, 195; price of gas per 1,000 cubic feet, 13.60 lire; no gas stoves in use. Wages of employés and hours of labor: 14.50 lire per diem for making gas; 13.50 lire per diem lamplighters; 7.50 lire, fitters. Laborers making gas are divided into two gangs for day and night. Lamplighters only work morning and evening. Fitters work ten hours per day or more when required.

The material used in manufacture of gas is, for the most part, coal, imported direct in sailing vessels from Newcastle-on-Tyne, but sometimes from Malta, where the same company has a large deposit. The price of coal at gas works is 33 lire per ton. Although the price of gas to private consumers is 13.60 lire per 1,000 cubic feet, the town lamps and public offices pay only 6.80 lire.

GEORGE RAYSON,
Consular Agent.

UNITED STATES CONSULAR AGENCY,
Marsala, April 26, 1890.

PALERMO.

REPORT BY CONSUL CARROLL.

According to the last census, taken in 1881, the population of Palermo was 241,618, but at present it is believed to be nearly 300,000.

Name of gas company, P. A. Favier (a Frenchman). Amount of money invested in the industry, about $800,000. Process of manufacture retorts.

Gas burners are of four different kinds, viz: Burners consuming 180, 140, 120, and 80 liters of gas respectively per hour. Burners consuming 180 liters per hour are placed in the principal streets, and those consuming 140, 120, and 80 in streets and localities according to the importance in the order named. The average amount of gas consumed by each burner is 140 liters per hour.

The number of gas-burners obtaining in 1888 amounted to 3,500. The hours of lighting and extinguishing the gas depend on the season, the average period of illuminating being 10½ per day. The quantity of gas consumed by private persons is calculated to be equal to half that consumed for illuminating the streets, squares, etc. From which it appears the annual output, during 1888, in Palermo, was liters 6,438,600,000, or 6,438,600 cubic meters.

In 1888 the number of consumers amounted to 3,000.

The contract price, entered into in 1861, still in force, is 28 centimes per cubic meter (about $16.20 per 1,000 cubic feet) for gas consumed by the municipality, and 48 centimes per cubic meter (about $29.53 per 1,000 cubic feet) for that consumed by private persons.

Gas is not used here for either heating or cooking, which is attributed to the high price thereof. In 1889 three machines were operated by gas power in Palermo, viz, one in a newspaper office, one in the marine college, and one in a pharmacy.

The wages paid employés vary from 2.50 to 3 lire for coal-heavers or firemen and from 4 to 5 lire for those engaged in the purification of the gas per day of ten hours.

The material used in the manufacture of gas is the Waldridge gas coal, from the mines of Durham (Newcastle). The average price of coal per ton, containing 1,016 kilograms, at this time, is 20 shillings, or about $4.86, free on board at Palermo, besides the expense attending its being placed in a convenient place, adjacent to or near the gas works, which amounts to 1.80 lire per ton.

PHILIP CARROLL,
Consul.

UNITED STATES CONSULATE,
Palermo, July 22, 1890.

TRAPANI.

REPORT BY ACTING CONSUAR AGENT MARRONI.

In reply I beg to inform you that the name of the gas company of this city is the Malta and Mediterranean Gas Company of London, established at Trapani in the year 1866. The amount of money in-

vested in the industry is not known in Trapani, the general administration at London only knowing this. Process of manufacture, retorts. The candle power of the gas is 14 candles, of London standard. The approximate annual out-put is 1,000 tons. The number of consumers 220. The price of gas per 1,000 cubic feet, 10 shillings 10½ pence.

The gas is generally only used for lighting purposes.

The wages of employés is £800* sterling per year and the hours of labor 9 per day. The material used in the manufacture of gas is the Pelton Main coals, obtained at Newcastle-on-Tyne, at the price of 20 shillings 11 pence per ton at the gas works.

IGNAZIO MARRONI,
Acting Consular Agent.

UNITED STATES CONSULAR AGENCY,
Trapani, April 23, 1890.

RUSSIA.

REPORT BY CONSUL-GENERAL CRAWFORD, OF ST. PETERSBURG.

In obedience to the instructions of the Department of State under date of February 15, 1890, I have prepared, with considerable care as to reliable data, the subjoined report on the gas industries of Russia. I am indebted to the following published works for the facts and figures on which this report is based, namely: The Industries of Russia, by P. A. Orloff; Information on Russia, issued by the central statistical committee, 1887; Statistische Mittheilungen über die Gasanstalten, vierte Auflage, München, 1885; Lectures on Oil, Gas, and Poisonous Water Gas, by S. Lamansky; Technical Control of the Gas Supply of Kieff, by I. Louatcheffsky-Patrounaki, 1888; and The Journal of Finance, Industry, and Trade, for 1886 and 1887.

The gas industry of the city of Moscow is in the hands of French capitalists doing business under the name of an English company, limited, and I am unable to learn the exact annual output from their gas works. However, a close approximation has been made, and the annual production of the following gas-manufactories of Russia, serving to light twenty-two cities with an aggregate population of more than 3,000,000 inhabitants, may be placed safely at 2,000,000,000 cubic feet, and tabulated as follows:

	Cubic feet.	
Coal gas	1,918,137,000	(Various cities.)
Wood and crude oil gas	32,263,000	(Kieff.)
Wood gas	37,210,000	(Vilna and Helsingfors.)
Oil gas	12,390,000	(Kazan and Yalta.)
Total	2,000,000,000	

* This evidently refers to the total force of employés at the works.

Finland.—In Finland, the grand duchy of the Russian Empire, only the cities Åbo, Helsingfors, and Wiborg have made any prominent use of gas for lighting purposes, these three towns producing according to statistics a sum total of 44,389,000 cubic feet for the year of 1887. The electric-light companies, however, are making great progress in many of the cities of Finland.

Åbo.—In Åbo, with about 30,000 inhabitants, the gas works are the property of the Åbo Gas Supply Company, limited. This city has about 500 street lamps and about 6,200 private burners.

Wiborg.—In the city of Wiborg, a town of some 20,000 inhabitants, the gas works belong to F. Bandholtz, and the gas is made from English coal, with admixture of cannel coal as in Åbo. The gas works are constructed on the plans of Thurston, having one furnace with seven retorts, two furnaces with four retorts, and one furnace with one retort; length, 9 feet 10 inches, with one air condenser, length, 12½ feet. The drain outside is 5 feet; inside, 4 feet 4 inches. There are two Thurston scrubbers, two purifiers, 13¼ by 9 inches, and one Beale exhaust worked by a gas motor of 2-horse power. Rarting's patent apparat with one gasometer, to register 2,120 cubic feet per hour; two gas-holders with a total capacity of 28,000 cubic feet. To purify the gas the mixture of Laming is used. The yearly production in 1887 of the works was 11,000,000 cubic feet. The daily maximum production of gas was 66,000 cubic feet. The maximum diameter of the pipes is 7 inches.

Helsingfors.—The gas works of Helsingfors, a city of 60,000 inhabitants, belong to a limited company. The gas used is manufactured from wood. The works were built in 1861, and consist of 3 furnaces, with 6 retorts, 1 horizontal condenser with a condensing surface of 290 square feet, 2 washers, 3 purifiers each having 107½ square feet, 1 gas-holder with a capacity of 265,000 cubic feet and with 1½ to 8-inch drainpipes.

Warsaw.—The gas works of Warsaw, a city of 450,000 inhabitants, are owned by the Deutsche Continental Gas-Gesellschaft in Dessau, and consume 2,740,488 poods (44,043 tons) of coal per annum, the coal being imported from Upper Silesia and from Austrian Silesia. These works were built in 1856. For lighting the streets the company receives for the first 53,000,000 cubic feet 30 cents per 1,000 cubic feet; for each additional 1,000 cubic feet, 58 cents. For private consumption the cost is now $1.10 per 1,000 cubic feet. For technical purposes the company charges 85 cents per 1,000 cubic feet. These works have 46 furnaces with 8 retorts each and 3 furnaces with 6 retorts each, total 386 clay retorts. The greatest production takes place in December, when 252 retorts are at work. The returns of cokes are 30,532 tons. Gas water is sold at $13 for every 1,000,000 cubic feet of gas produced. For cleansing this gas the composition of Dr. Diecke is employed. The number of consumers is about 6,600, having about an equal number of gasometers in use, only an insignificant number of them being dry meters. These works have 2 condensers, 20 scrubbers, 10 purifiers, 5 gas-holders with

a total capacity of 1,700,000 cubic feet, 3 regulators, 2 gasometers and 4 exhausters. In 1886, the production was 458,779,000 cubic feet, the maximum daily production being 2,131,000 cubic feet. The number of ordinary street burners in the same year was 5,600, with 20 regenerative Siemens burners. The number of private burners in the same period amounted only to 83,000. There were 50 gas motors with a total of 215 horse power, and these were combined with about 2,600 heating apparatus. The total length of the street pipes, with diameters varying from 2 inches to 24 inches, amounted to 100 miles.

Wilna.—The gas works of Wilna, with a population of 103,000, are the property of the Neue Gas-Actiengesellschaft in Berlin and consume 512 cubic fathoms of wood, equal to 1,287 tons of pine wood, in the manufacture of gas yearly. These works have existed since 1863. The price per hour for street lamps, burning at least 4 cubic feet, is about 1 cent each. Private consumers pay $2 per 1,000 cubic feet. For the cleansing of this gas a large quantity of lime is used. The returns for the gas manufacture are 612,000 pounds of charcoal and about 14,400 pounds of wood vinegar. The number of consumers in 1887 was 300. In the production of this gas, 2 furnaces with 3 retorts, 1 furnace with 2 retorts, and 1 with 1 retort, 3 of which are of cast iron with a length of 9 feet by 4 inches, and the remaining 9 retorts are of clay with a length of 9 feet, all of them being about 2 feet high and 2 feet wide. In 1887 there were in use in this industry 2 scrubbers, 3 purifiers, 1 gas-holder with a capacity of 50,000 cubic feet, 1 regulator, 1 gasometer, and 1 steam engine, producing 15,210,000 cubic feet of gas. The maximum quantity consumed per day was 80,000 cubic feet. The number of street lamps was 332, the private burners amounting to 3,754. The total length of the street pipes with diameters from 2 inches to 10 inches amounted to 8 miles.

Dorpat.—The gas works of Dorpat, numbering 33,000 inhabitants, use New Pelton coals to the amount of 825 tons, and of Australian boghead 34,920; these works were constructed in 1880. The price to private consumers is $1.50 per 1,000 cubic feet, with a rebate of 5 per cent if more than 150,000 cubic feet are consumed per year and a rebate of 10 per cent if more than 250,000 cubic feet are consumed. These works are the property of the city. There are 92 gasometers (of which an insignificant number are dry meters), 4 regenerating furnaces of the Liegel pattern, with 14 clay retorts, 15 by 20 inches and heated with coke. The maximum number of retorts used at any one time is 5; there are 4 condensers, 1 scrubber, 3 purifiers, 2 gas-holders, and 1 gas meter. The returns from these works consist of 536 tons of coke and 88,524 pounds of tar. The quantity of gas produced in 1889 was 8,584,200 cubic feet, the maximum daily consumption being 44,800 cubic feet; there were 381 street lamps in use, their drainpipes varying from 2 to 7 inches.

Kazan.—The gas works of Kazan, with a population of 145,000 in

habitants, belong to Bashmakoff. This gas is produced from mineral oils, and 459 tons of residues are used yearly. This gas, however, smokes. These works have existed since 1874; the price for street lighting is $4.62½ per 1,000 cubic feet, each street lamp consuming 2½ cubic feet per hour; the price for private consumption varies from $5.50 to $7.50 per 1,000 cubic feet. These works have 6 furnaces, each containing 5 horizontal retorts, each 6 feet 8 inches in length and 9 inches in diameter. In 5 of the furnaces the retorts are made of cast iron; the sixth is made of clay; the maximum number of retorts at work is 15. During the summer, because little artificial light is needed in this northern district, the works are shut down for nearly 2 months. In order to heat these retorts 180,360 pounds of residues, 127,268 pounds of tar, and 38,500 cubic feet of gas are annually consumed. In cleansing this gas 4,860 pounds of clay, 1,600 sheaves of cornstalks and several loads of straw are used per annum. The returns from these works consist only of about 180,000 pounds of tar; the works consist of a tubular condenser, 1 scrubber, 2 purifiers, 1 telescopic gas holder with a capacity of 65,000 cubic feet, 1 regulator, 1 gasometer, 1 steam engine of 4 horse power, 1 gas motor of 2 horse power of Kurting's patent, and 2 Beale exhausters. There were 9,930,000 cubic feet of gas produced in these works in 1887. The maximum daily consumption was 62,000 cubic feet. There were in the same year 1,200 street lamps and 6,500 private burners, together with 3 gas motors. The total length of the street pipes was about 23 miles with some 250 gas meters.

Kalish.—The gas works of Kalish, a town of about 25,000 inhabitants, belong to one Bril, of Breslau. This gas is made from Upper Silesian coal. For street lighting the price is $1.35, and for private purposes $1.55 per 1,000 cubic feet. These works have 1 furnace with 2 retorts, 1 with 3 retorts, and 1 with 5 retorts; 3 condensers, 1 scrubber, 1 washer, 3 purifiers, and 1 gas holder with a capacity of 36,000 cubic feet. The annual production is 6,500,000 cubic feet. There are in town 265 street lamps and about 2,000 private burners. The drain pipes vary from 2 to 8 inches in diameter.

Kieff.—The gas works of Kieff, a city of 245,000 inhabitants, belong to the Kieff Gas Company, Limited. This gas is made of oil and wood. These works were first constructed in 1872. The gas thus manufactured is required to have a light equal to 12 sperm candles to every 3 cubic feet per hour. For the burning of street lamps for a period of 1,800 hours, the city pays only $10 per year per lamp; the price of gas for public buildings is $3.15, and for private consumers $3.75 per 1,000 cubic feet. The annual production of these works in 1888 was 25,365,000 cubic feet.

Cronstadt.—The gas works of Cronstadt, a town of about 50,000 inhabitants, are the property of Holte & Co. These works consume annually 2,048 tons of Nettlesworth and Leverson coal. They were built in 1868 and it is required that every 5 cubic feet of gas must give a

light equal to 10 stearine candles, 4 to the pound. For street lamps, with a 14-candle power burner, the price is $10 per year, burning 2,000 hours. The price for Government buildings is $1, for private consumers, $1.25 per 1,000 cubic feet. These works consist of 3 regenerative furnaces of 8 retorts, 2 furnaces of 6 retorts, and 1 furnace of 3 retorts, 1 tubular condenser, 6 scrubbers, 1 "Beale" exhauster, 1 washer, 4 purifiers, consisting of the Diecke composition, 1 gas holder with a capacity of 80,000 cubic feet, and 125 gasometers. The annual production of these works is about 25,000,000 cubic feet. The maximum consumption per day is about 144,500 cubic feet. There are 465 street lamps and 7,850 private burners, 2 gas motors of 10 and 12 horse power each, 43 gas apparatus for heating and cooking purposes. The aggregate length of the pipe line is 15 miles. The drain pipes vary from 2 inches to 1 foot in diameter.

Liban.—The gas works of Liban, a city of 35,000 inhabitants, belong to the firm of Schmidt & Bichel. The gas is made from English coal; the works were built in 1882. The price for street lighting is $1.25 for 1,000 cubic feet, for private consumption $1.62½. These works are composed of 1 furnace with 9 oval retorts, 3 furnaces with 7, and 1 furnace with 3 retorts, all the furnaces being of the regenerative system of Liegel; 1 condenser, 3 scrubbers, 1 exhauster, 1 steam engine, 2 gasometers, 1 gas holder with a capacity of 70,000 cubic feet, 1 telescopic gas holder with a capacity of 140,000 cubic feet, and 1 apparatus for the distillation of gas water under Gareis's patents. The annual production of these works is 24,000,000 cubic feet. There are 500 street lamps. The aggregate length of the pipe is 20 miles, the diameters of which vary from 1½ inches to 16 inches.

Lodz.—The gas works of Lodz, a city of 115,000 inhabitants, were built in 1869. The gas is made from coal, of which 6,707 tons is used per annum. The price of gas for street lighting is 75 cents; for private consumption, $1.50; and for technical purposes, $1.25, per 1,000 cubic feet. This gas is cleansed by the use of iron ore. The returns from these works consist of 4,125 tons of coke, 870,732 pounds of tar, and 1,728,000 pounds of gas water, from which ammoniac is manufactured. There are 828 gasometers, of which 350 are dry meters. The gas works contain 10 furnaces of 6 retorts, and 4 regenerative furnaces, of the Liegel pattern, of 6 clay retorts; 12 condensers, 1 Peluse and Odouen apparatus, 6 scrubbers, 2 Thurston apparatus, 8 cleansers, 4 gas holders with a total capacity of 300,000 cubic feet, 2 regulators, 2 gasometers, 2 steam engines, 1 gas motor, and 2 exhausters. In 1867 these works produced gas to the amount of 70,724,650 cubic feet. The maximum daily consumption, 478,000 cubic feet. There are 497 street lamps, 25,000 private burners, and 10 gas motors. The aggregate length of the mains is 20 miles, with diameters varying from 6 to 16 inches.

Lublin.—The gas works of Lublin, a city of 40,000 inhabitants, consume about 1,044 tons of coal per annum in the manufacture of gas.

These works belong to the Engineer Soulagarski and were built in 1880. The cost of lighting the streets is but $12 per year per lamp; private consumers pay $1.37½ per 1,000 cubic feet. These works contain 3 furnaces with an aggregate of 12 clay retorts. The maximum number of retorts at work in winter months is only 10. There are about 200 individual consumers with an equal number of gasometers, of which only 8 are dry meters. These works consist of 1 horizonital condenser, 2 scrubbers, 3 cleansers, 1 gas-holder, 1 regulator, 1 gas meter, 1 exhauster, 1 Körting exhauster with boiler. For cleansing this gas, 25,380 pounds of iron filings and 12,600 pounds of clay are used per annum. The returns from these works consist of 4,470 baskets of coke and 119,800 pounds of tar. The annual gas production is 11,470,000 cubic feet, the maximum daily consumption being 55,160 cubic feet. There are 250 street lamps and 1,500 private burners. The aggregate length of the pipe lines is 9 miles, with mains of small dimensions.

Moscow.—The gas works of Moscow, a city of 800,000 inhabitants, belong to French capitalists doing business under the name of an English company, limited. There are 9,020 street lamps with common burners, 30 regenerative Siemens burners, 48 Sega burners, and 12 lamps with double burners. These works were built in 1866. For every street lamp burning 5 cubic feet per hour, giving a 12-sperm-candle power, the town pays $7.50 per year. The price for private consumption is not to exceed $2.50 for 1,000 cubic feet. I have been unable to obtain any detailed description of these works sufficiently accurate to be of use in this report.

The gas works of Odessa, a town with a population of 300,000, belong to the Odessa Gas Company, limited, and manufacture coal gas, using annually 9,427 tons of Newcastle coal, 106 tons of cannel, and 804 tons of Donnetz coal. These works were built in 1866. The cost of lighting the streets is $9 per lamp per year, the price for government and public buildings being $1.25, for private consumers $1.50 per 1,000 cubic feet. The number of consumers is 1,500, with about an equal number of gasometers. The returns from these works consist of 3,857 tons of coke and 498 tons of tar. These gas works comprise 12 ordinary furnaces and 8 regenerative furnaces; the maximum number of retorts at work in December was 88, 6 condensers, 8 scrubbers, 8 purifiers, 2 gas-holders with a total capacity of 75,000 cubic feet, 1 telescopic gas-holder with a capacity of 150,000 cubic feet, 2 regulators, 2 gas meters, 1 gas motor of 2 horse power, and 2 Beale exhausters. For cleansing this gas 432,000 pounds of clay, 36,000 pounds of iron ore, and 3,600 pounds of blue vitriol are used yearly. The annual gas production in 1887 was 10,261,000 cubic feet, the maximum daily consumption being 487,000 cubic feet. The number of street lamps in the city is 2,133, with 20,590 private burners, and 13 gas motors, the latter varying from 1 to 8 horse power, with a total of 39 horse power. The aggre-

gate length of the pipe lines is 53 miles, with diameters varying from 2 to 16 inches.

Ostashkoff.—The gas works of Ostashkoff, a town of about 15,000 inhabitants, are the property of the town. The gas here manufactured is made from the bark of birch trees, and a comparatively small number of buildings only are lighted with this gas. I have been unable to obtain any reliable data on which to base a description of these works.

Reval.—The gas works of Reval, a city with a population of 60,000, are the property of the town and consume yearly in the production of gas 1,659 tons of coal. These works were built in 1865. For lighting the streets for a period of 1,600 hours, the price is $8 per lamp for the year. For private consumers the price is $1.25 per 1,000 cubic feet, with a discount of 5 per cent for every 50,000 cubic feet consumed. There are 217 gasometers, of which 95 are dry. For cleaning this gas, 99,825 pounds of lime are used per annum. The returns from these works consist of 1,080 tons of coke and 210 barrels of tar. There are 5 ordinary furnaces, 2 regenerative Hasse-Vaschersh systems, 3 condensers, 1 scrubber, 5 purifiers, 1 gas-holder with a capacity of 28,000 cubic feet, 1 gas-holder with a capacity of 22,000 cubic feet, 2 regulators, 1 gas meter, 1 steam engine, and 1 exhauster. The production in 1886 was 16,264,200 cubic feet, the maximum daily consumption being 86,500 cubic feet. There were 326 street lamps, 3,460 private burners, and 1 gas motor. The aggregate length of the mains is 12 miles, with diameters varying from 1½ inches to 7 inches.

Riga.—The gas works of Riga, a city of 185,000 inhabitants, are the property of the town. The gas is made from soft coal, of which 2,812 tons are consumed annually. The first works were built in 1862, with 1 gas-holder containing 18,000 cubic feet, and placed in the part of the city known as Miltan Forstadt. The price of gas to private consumers is $1.25 per 1,000 cubic feet. These works contain 3 furnaces each 6 retorts, 3 furnaces having 6 clay retorts each, 1 Didier pattern regenerative furnace with 8 retorts, 1 air condenser, 1 scrubber, 2 Beale exhausters, 2 steam engines of 4-horse power, 2 steam boilers, 1 "standard" washer, 4 purifiers with Laming's composition, 2 lime cleansers, 1 gas meter, 2 telescopic gas-holders (each with a capacity of 50,000 cubic feet), 2 regulators, and 1 gas motor of 1-horse power. The gas production in 1886 was 99,205,000 cubic feet. In 1888 there were 1,538 street lamps and 25,791 private burners. The total length of the mains was 443 miles. The diameter of the pipes varies from 2 to 20 inches. The maximum daily consumption was 590,200 cubic feet and the minimum consumption was 56,300 cubic feet. A second set of gas works was constructed in Riga in 1874, and considerably enlarged in 1882. These contain 9 furnaces of 6 retorts each, 6 Didier regenerative furnaces with 8 retorts each, 4 condensers, 4 scrubbers, 3 exhausters of the Beale pattern, 3 Bepas regulators, 2 steam engines of 12-horse power each, 2 steam boilers, 6 cleansers with the Laming's composition, 2 gas meters,

1 gas-holder with a capacity of 112,000 cubic feet, 1 gas-holder of 265,000 cubic feet, 3 regulators, 1 steam engine of 4 horse power, 1 Feldmann apparatus for working the gas water, with steam boilers and steam pump.

Rostoff-on-Don.—The gas works of Rostoff-on-the-Don, a town of 70,000 people, belong to the Paris Financial Company. The gas is made of ordinary coal. These works were first built in 1879. The price of gas for street lamps is on the average about 10 cents per hour each, the contract price to private consumers being $2 per 1,000 cubic feet, but in reality they have been charged only from $1 to $1.60, according to the varying price of coal. These works comprise 48 retorts distributed among 6 furnaces. For cleansing the gas 9,000 pounds of lime are consumed annually. The returns for these works consists of 1,600 tons of coke and 234,000 pounds of tar. The maximum number of retorts at work is 24, and this in the month of December each year. These works contain 4 condensers, 3 scrubbers, 4 purifiers, 1 gas-holder, 1 regulator, 1 gas meter, 2 exhausters of the Körting system, 216 consumers, 196 gasometers. The gas production in 1887 was 28,106,500 cubic feet, the maximum daily consumption being 144,500 cubic feet. There were in the same year 1,039 street lamps and 4,169 private burners, 2 gas motors, 3 apparatus for heating iron, 7 heating stoves, and 15 for cooking purposes. The aggregate length of the mains is 17 miles, the pipes varying from 3 to 16 inches in diameter.

Taganrog.—The gas works of Taganrog, a city of 60.000 inhabitants, are the property of the town. The gas is made from soft coal, of which 919 tons per year are required. These works were built in 1870. For a period of 1,500 hours' lighting of the streets the cost is $9 per lamp, for private use the price being from $1.25 to $1.75 per 1,000 cubic feet. The works include 82 gasometers, 70 consumers, 1 stove, 2 regenerative furnaces heated with coke, with a total of 14 retorts. These works consume 1,152 pounds of vitriol, 21,600 pounds of iron ore, and 396 pounds of clay for purifying the gas. The returns consist of 651 tons of tar. There are 1 condenser, 1 scrubber, 4 purifiers, 1 gas-holder, 1 regulator, 1 gas meter, and 1 Körting exhauster. The product in 1887 amounted to 8,976,600 cubic feet, the maximum daily consumption being 49,500 cubic feet. There were in the same year 638 street lamps, 1,683 private burners, and 5 heating apparatus for different purposes. The aggregate length of the gas mains is 12 versts or 8 miles, their diameter varying from 2 to 12 inches.

Tver.—The gas works of Tver, a city of 40,000 people, are the property of the town, and were built in 1865. The gas is made from coal, of which 522 tons are used yearly. The cost of lighting the streets for a period of 1,000 hours amounts to $8.50 per lamp, private consumers paying from $1.15 to $1.50 per 1,000 cubic feet. These works comprise 18 gasometers, 41 consumers, 4 retort furnaces, 1 condenser, 1 scrubber, 3 purifiers, 1 gas-holder, 1 regulator, 1 gas meter, 1 Körting exhauster.

The production in 1887 was 3,338,237 cubic feet. The returns from these works consisted of 334 tons of coke and 35,100 pounds of tar. There were in the same year 250 street lamps and 666 private burners. The aggregate length of the mains was eight miles, the diameter ranging from 2 to 8 inches.

Charkoff.—The gas works of Charkoff, a city of 175,000 inhabitants, are owned by the town, and were first constructed in 1871. The gas is made from soft coal, of which 3,814 tons are used yearly. For lighting the streets for 2,500 hours the price is $10 per lamp, private consumers paying $1.75, and public buildings $1.50 per 1,000 cubic feet. There are 327 gasometers, 300 consumers, 4 generative furnaces with clay retorts 9 feet long. The maximum number of retorts at work is 30 during the December month. For cleansing this gas 106,560 pounds of clay, 43,200 pounds of iron ore, and a large quantity of sawdust are used annually. The returns from these works consist of 2,571 tons of coke and of 31,824 pounds of ammoniac salt. There are in the works 6 condensers, 2 scrubbers, 6 purifiers, 2 gas-holders, each with a capacity of 75,000 cubic feet, 1 regulator, 1 gas meter, 1 gas motor of 2 horse power, and 1 Körting's exhauster. The annual production in 1887 was 35,868,200 cubic feet. The maximum daily consumption in the same year was 170,300 cubic feet. There were 6,732 private burners and 1,012 street lamps, 5 gas motors and 8 gas furnaces for various uses. The length of the mains is about 30 miles, with diameters from 2 to 18 inches.

Yatta.—The gas works of Yatta, a town of about 4,000 inhabitants, manufacture gas from crude oil, of which 266,400 pounds are required annually. This gas, however, although such articles as vitriol, sawdust, lime, iron, and wood have been used to purify it, with varying results, smokes and is otherwise unsatisfactory. These works were built in 1884. For lighting the streets for an aggregate of 2,000 hours per year the price is $7 per lamp burning 1½ cubic feet. Private consumers pay from $3.50 to $6 per 1,000 cubic feet. In 1884 the production was 2,461,000 cubic feet. The number of private burners was 1,200, with 2,300 burners for public illuminations and 170 street lamps. These works comprise 1 gas-holder and 3 furnaces for the manufacture of the gas from crude oil.

St. Petersburg.—The city of St. Petersburg, numbering, according to the latest estimate, 1,000,000 inhabitants, has several gas companies in active operation at the present time. The old gas company, as it is still called, was established in 1835, and manufactures gas from bituminous coal. These works comprise 242 retorts, with an average of 7 retorts to each furnace, 1 Beale exhauster, 6 gas-holders, with a total capacity of 750,000 cubic feet, and about 3,000 gasometers. The gas production is 180,000,000 cubic feet. There are 20 gas motors, ranging from 4 to 10 horse power. The aggregate length of the mains is 28 miles, with pipes varying from 2 to 30 inches in diameter.

The Metropolitan Gas-Lighting Company of St. Petersburg supplies a large portion of the city with coal gas, using 62,450 tons of coal per year. The price for lighting the streets for an aggregate of 3,200 hours has been $14.50 per lamp. For Government buildings the price has been $1.45, and for private consumers $1.70 per 1,000 cubic feet. Recently the company has reduced these prices to $1.13 for technical purposes, $1.30 for private consumption. These works contain 3 groups of condensers, 6 ordinary scrubbers, 2 "Standard" scrubbers, 32 purifiers, 6 gas-holders, with a capacity of 2,000,000 cubic feet, 5 regulators, gas meters, and 6 steam engines. The gas production in 1887 was 637,496,200 cubic feet. There were 7,852 street lamps, 120,524 private burners, and 72 gas motors, aggregating 319 horse power. The total length of the gas mains is about 165 miles.

The gas works of Vassili Ostroff, an island on the north side of the river Neva, and forming a portion of the city of St. Petersburg, furnish a large portion of the gas for the inhabitants of the island. These works contain 9 Biley's exhausters, and manufacture gas from coal in the usual manner. The returns from these works consist of 44,469 tons of coke, 2,893 tons of tar, and 5,416 tons of ammoniac water. The number of consumers is about 3,200, with an equal number of gasometers. The aggregate length of the mains is about 27 miles.

The gas works of the Wiborg and old St. Petersburg portion of the city of St. Petersburg belong to a limited company, and manufacture gas from Newcastle coal, the quantity of coal used being 7,717 tons per annum. The gas production in 1888 was 73,128,630 cubic feet. There were 1,457 street lamps and 10,500 private burners in the same year. The gas works of the Marshall Academy belong to the same company and from both of these works there are obtained annually 5,152 tons of coke and 302 tons of tar.

Private gas companies.—In addition to the cities and towns enumerated above, employing gas for lighting and heating purposes, there are about 40 railway stations in the Empire lighted either with coal gas or petroleum gas, and about 160 gas manufactories established in separate buildings for the use of factories, stores, banks, and other private enterprises of various descriptions.

It is to be regretted that the statistics on which the foregoing report is based are not more recent, but the publications on the gas industries of Russia are not made annually. The data herein used are the latest official figures, and must therefore serve the purpose, as any other than official information would be misleading.

WATER GAS.

The laws of Russia forbid the manufacture and use of this gas, on the ground that the gas is injurious to health. There is a special article in the patent laws of the country to the effect that no mechanical device nor any chemical combination producing articles injurious to the health of the people are patentable, and if patented under disguise or igno-

rance of this fact the patent becomes invalid. Many parties have made repeated efforts to introduce water gas in Russia, but all such applications have been rejected, invariably meeting with the unanimous opposition of the Imperial Society for the Preservation of Health.

KOUSNETZOFF PETROLEUM GAS.

I can not in justice close this report without giving at some length a description of a new gas prepared by some patent process invented by a citizen of Russia, by name W. S. Kousnetzoff. This gas is made from crude petroleum or from any form of mineral oils, and gives a beautiful, steady light of great brilliancy, and has no qualities that are injurious to animal or vegetable life; neither does it produce any change in colors, blue and green being clearly distinguishable by this light. This gas has already created a sensation beyond the borders of Russia, and bids fair to revolutionize the gas industries of the world. The Russian Government has adopted this gas with very satisfactory results. I have visited the barracks of the Emperor Paul Regiment, an immense building in St. Petersburg, where this gas is exclusively used, and I am surprised at the simplicity of the apparatus for its manufacture and delighted with the perfect illumination of the many rooms lighted by it.

The doing away with purifying materials and of manual labor, a mere boy being able to manage the entire gas works, seems to point to a new era in gas manufacture. The works are extremely simple and compact and may all be included in a single room of small dimensions. The diameter of the pipes is hardly half that necessary for coal gas, thus reducing immensely the cost of construction of the mains and smallest pipes. If this gas is manufactured from crude petroleum or residues, a brilliant white light is produced, giving a power equal to 12 candles to every cubic foot, even in ordinary open burners consuming as high as 3 cubic feet of gas per hour, and without the least odor or smoke. This is equivalent to six times the amount of light produced by coal gas in commercial burners.

A prominent feature of this gas is that the rays of light are very long, even in the smallest burners and therefore only a few burners are required to light a large room. Another characteristic of this gas lies in this, that when the light is turned down, the brilliancy decreases in proportion to the amount of gas consumed, so that in very small flames the brilliancy has been estimated at forty times that of ordinary coal gas under similar conditions.

This gas can be made at will, with a very high, medium, or low illuminating power, and the price will vary accordingly. When undiluted, the gas contains no carbon dioxide, nor any sulphuric combinations whatever, and when diluted to the utmost, it then contains a much smaller ratio of these noxious agents than either coal or water gas.

In using the Kousnetzoff gas for steam engines 10 cubic feet per hour are sufficient for every horse-power required. The cheaper or diluted

gas can be economically used in steel, glass, and other factories; the pure or undiluted gas, however, gives double the heat of coal gas.

If this gas should be adopted in the United States, where crude oils can be bought at only 3 cents per gallon, from 10 to 12 gallons being required to produce 1,000 cubic feet, the cost would be about as follows: 12 gallons, at 3 cents=36 cents; 6 gallons, in heating furnace=18 cents; total, 54 cents per 1,000 cubic feet. In this calculation no account is taken of labor, as a boy can manage the apparatus, consequently 1,000 cubic feet of gas of 12,000 candle power would cost but 54 cents, and of this about one-third would be returned in form of lampblack and tar produced in the manufacture, so that the cost would be reduced to about 36 cents per 1,000 cubic feet. Now, if this gas were reduced only three times for economic purposes in factories, it would cost but 12 cents per 1,000 cubic feet, and if this gas be mixed with atmospheric air, as other gases are used in glass and steel factories, the price could be reduced to 2 cents per 1,000 cubic feet, and with satisfactory efficiency.

The most useful point in the consideration of this gas lies in the fact that the gas is not a mechanical mixture, as in the case of Lothhammer's, Muller's, and other forms of naphtha gas, but is a perfectly fix gas, or chemical composition. Therefore, the Kousnetzoff gas is the only gas yet discovered that can travel in underground pipes at all temperatures without decomposing or condensing into fluids.

Thinking that possibly some one in the States might become sufficiently interested in this gas to desire to learn more in reference to it, I will add here that all the patents for the Kousnetzoff gas are now the property of one Frederick Sanders, of this city, and who has erected experimental gas works at Brockley, London, S. E., in order to introduce to advantage this gas to the world. I am inclined to believe that the Kousnetzoff gas will play an important role in the future, both for lighting and for heating purposes.

NAPHTHA.

In closing this report I extract the following from the published reports of an investigation made by Profs. A. Dianin and A. Borodin, of the Imperial Martial Medical Academy of this city, and certified by Secretary Resno:

The naphtha gas produced by Kousnetzoff and taken from his works in a portable gas holder has the following composition, according to my analysis:

Hundred parts of gas mixture, according to volume, contain—	Kousnetzoff's naphtha gas.	Ordinary coal gas.
Heavy hydrocarbons	25.26	3.56
Light hydrocarbons	56.60	35.28
Carbon oxide	.....	7.40
Hydrogen	17.02	51.24
Air { Oxygen, 0.23 / Nitrogen, 0.90	1.13	.....
Nitrogen	.....	2.24
Carbonic acid	0.14	0.28

Coal gas contains sulphur besides. The coal gas made at the Imperial Martial Medical Academy contains, according to our investigations, from 1.7 to 1 gram sulphur on 1,000 liters.

Kousnetzoff's naphtha gas when burning in one to three burners does not produce the least smoke, nor in general any products of combustion.

The possibility of Kousnetzoff's gas burning in 3-feet burners, in which other naphtha gases give a smoking flame, can be explained by the reduced quantity of heavy hydrocarbons and the augmented contents of light hydrocarbons dissolving the gas mixture.

In order to get similar intensity of light, six times less of Kousnetzoff's naphtha gas in comparison to coal gas is required.

The enormous power of Kousnetzoff's naphtha gas in comparison to coal gas is explained by the considerable quantiy of heavy hydrocarbons, in the first, and the small quantity in the latter.

In consequence of the small quantity of hydrogen in Kousnetzoff's naphtha gas and the small consumption of it in comparison to coal gas, the surrounding temperature never rises so high as with coal-gas light.

Kousnetzoff's gas cooled to 35° C. does not condense any fluid hydrocarbons, and does not perceptibly lose its power of light.

With these observations on the various gas industries of Russia, I pass this report to the disposal of the Department.

J. M. CRAWFORD,
Consul-General.

UNITED STATES CONSULATE-GENERAL,
St. Petersburg, June 6, 1890.

SPAIN.

CADIZ.

REPORT BY CONSUL TURNER.

The only direct and reliable information secured was from the Spanish Gas Company, the Sociedad Coöperativa Gaditana de Fabricacion de Gas, of this city.

I entered into correspondence with all the others of this district and called in person upon a few, but in each case I was informed politely that the information desired by the Department was not for the public, etc. Thinking that I might secure the data desired at Madrid, which is the headquarters for the larger companies, I addressed a letter to the secretary of the legation with that object in view, with the following result:

MADRID, *May 8, 1890.*

DEAR MR. TURNER:

In reply to yours of April 14, ultimo, I tried in vain to obtain the information you desired, but the company have politely declined, or words to that effect. I can find no published reports of their business.

Yours, very truly.

H. R. NEWBERRY.

In spite of these difficulties, which have caused the delay above referred to, I believe that the data herewith submitted will be useful, being absolutely reliable in the case of the Coöperativa Gaditana, and fairly so in all other respects.

ROBERT W. TURNER,
Consul.

UNITED STATES CONSULATE,
Cadiz, May 31, 1890.

[Inclosure in Consul Turner's report.]

REPORT OF COÖPERATIVA GADITANA.

The name of this company is the Sociedad Coöperativa Gaditana de Fabricacion de Gas, and the amount of capital invested is $250,000. The process of manufacture is Siemen's economic generators, invented by Aug. Klöne, of Dorsmund.

Power of gas is 16 candle and the approximate annual output is 3,300,000 cubic meters, which are consumed by 2,500 consumers. The price charged for lighting purposes is 4 cents per cubic meter, and 3 cents per cubic meter for use of stoves and other purposes. Gas is supplied by this company for lighting, for heating, and for cooking stoves, and motors. The wages paid are: Engineer $100 and foreman $50 per month; fireman 80 cents and laborers 50 cents per day of twelve hours. The working month includes Sundays and holidays.

The material used is common Newcastle and Pellow Main coal, mixed with 5 per cent of cannel coal. The price paid ranges from $6 to $6.40 per ton delivered at the works.

There is one other gas plant in Cadiz, the Lebon Company, of Paris, and I am of opinion that the annual output and the amount invested, and, in fact, all the conditions of this last-named company do not differ materially from the Coöperativa Gaditana, and, indeed, the gas business of Cadiz can safely be made a basis for estimating the gas industry of all other Spanish cities of the same population, which, in round numbers, is 60,000.

The price of gas, however, differs very much, depending upon competition and the distance from seaports.

The principal companies operating in Spain are the La Sociedad Catalana, of Barcelona, and M. Lebon, of Paris, who between them own about two-thirds of the gas works in Spain. These companies have plants in Madrid, Ciudad Real, Cordoba, Zaragoza, Granada, Sevilla, Utrera, San Fernando, Jerez, Puerto Sta Maria, Cadiz, Barcelona, Valencia, Cartagena, Murcia, Alicante, Alcoy, Jativa, Gandia, Denia, Malaga, Bilbao, San Sebastian, Coruna Santander, Vitoria, Leon, Linares, Reus, Jaen, Lerida, Gerona, Toledo and Huelva. The others are generally local Spanish companies.

The process of manufacture has undergone little improvement, and Huelva is the only town I know of where the regenerative system of retort bench is in use.

The candle power of gas in Spain ranges from 10 to 15 sperm candles.

The price of gas ranges from $1.75 to $3 per 1,000 cubic feet, according to distance from seaboard, etc.

In the past very few gas stoves have been used, so the gas companies have to push the sale of gas for cooking and heating purposes, and for that reason generally make a slight reduction in the price of gas used for stoves, motors, etc.

Wages of employés: Common laborers, from 40 to 50 cents, and stokers from 60 to 80 cents per day. The time of labor is from ten to twelve hours per day.

Coal is the only material used for the production of gas, and is, with one or two exceptions, brought from England, the price ranging from $6 to $6.50 per ton delivered at the works.

SWEDEN AND NORWAY.

NORWAY.

REPORT BY CONSUL GADE, OF CHRISTIANIA.

The following cities are lighted by gas: Christiania, Drammen, Moss, Fredrikshald, Skien, and Christiansand.

CHRISTIANIA.

Christiania, the capital of Norway, situated at the inner end of the Christiania Fiord, with a population of 145,000.

The Christiania gas works belong to the community. The amount invested by the city is reported to be $441,396.

The gas produced is the ordinary coal gas. The process done by sulphurous acid and ferric oxide.

The power of gas is equal to sixteen candles.

The annual output is 167,000,000 cubic feet. Number of consumers, 3,205.

Price of gas for illumination, $1.14 per 1,000 cubic feet with 5 or 10 per cent discount for consumers, in proportion to quantities used. Price of gas for cooking and technical purposes, 76 cents per 1,000 cubic feet without discount.

Number of gas stoves for heating, 20; cooking, 300; gas motors, 13.

Wages of employés, from 54 to 80 cents for twelve hours of labor per diem.

New Pelton coal from Newcastle. Their cost in 1889, 14 shillings, English, per ton.

DRAMMEN.

Drammen on the Drammen Fiord, 20,000 inhabitants.

Drammen gas works belonging to the city. Capital invested, $53,600.

Process, the usual one. Coal heated in retorts by coke.

Power of gas, 16 candles.

Number of consumers, 320.

Price for illumination, $1.52 per 1,000 cubic feet and 95 cents for cooking. It is proposed to reduce the prices to $1.14 and 68 cents, respectively, per 1,000 cubic feet.

Use of gas stoves for cooking is on the increase. Heating by gas used only by a few persons.

Wages of stokers, 67 cents per twelve hours of labor, and for other workmen, from 53 to 60 cents.

Newcastle coal, which in 1889 cost 13 shillings 3 pence, English, per ton delivered in Drammen. For the gas manufacturing and its cleansing only lime is employed. It cost 47 cents per hectoliter.

MOSS.

Moss, on the Christiania Fiord, 5,000 inhabitants.

Gas works belong to the city of Moss. Capital invested, $26,800.

Cleansing by lime.

Power, 16 to 18 candles.

The amount of output is 100,000 cubic meters. There are 60 consumers.

Price of gas, 5 cents per cubic meter.

There are only 3 or 4 gas stoves for cooking.

Gas works employ only 3 men, whose aggregate wages per week (one day of twelve labor hours) amount to $12.96.

Coal of different kinds cost $3.36 per ton.

FREDRIKSHALD.

Fredrikshald, southern Norway, with 10,000 inhabitants.

Fredrikshald gas works belong to the city. Capital invested, $35,376.

Ordinary coal gas cleansed by lime.

Candle power, 16 to 18.

Production, 4,500,000 cubic feet.

Number of consumers, 150.

Prices, $1.34, $1.61, $1.88 per 1,000 cubic feet.

There are 12 gas stoves for cooking in use.

Wages, 43 to 54 cents for twelve hours of labor.

Londonderry coal from Seaham cost in 1889 twelve shillings 9 pence English per ton. The retorts are from the Stettin Chamotte Manufactory.

ARINDAL.

Arindal, seaport, 4,500 inhabitants.

Arindal gas works belonging to the city. Capital invested, $18,760.

The process is old fashioned; cleansing done by lime.

Power equal to 16 candles.

Annual output, 2,445,000 cubic feet.

Number of consumers, 119.

Price of gas, from $1.61 to $1.88 per 1,000 cubic feet; $1.50 for cooking.

Only 10 gas stoves for cooking in use.

Stokers' wages, 75 cents per day.

Newcastle or Londonderry (Seaham) coal; price, 16 shillings, Engl per ton.

CHRISTIANSAND.

Christiansand, seaport, 13,000 inhabitants.

Gas works belonging to the city. Capital, $33,232.

Gas manufactured in 3 stoves, each containing 5 retorts.

Price of gas, $1.74 per 1,000 cubic feet for illumination; $1.37 for cooking.

Gas stoves for cooking in use, 25.

Wages of stokers, $1.39 for twenty-four hours of labor.

New Pelton coal cost in 1889 $3.48 per ton and Ramsay cannel cost $5.57 per ton.

GERHARD GADE,
Consul.

UNITED STATES CONSULATE,
Christiania, May 20, 1890.

SWEDEN.

REPORT BY CONSUL MAN, OF GOTHENBURG.

The names, locations, and population of cities using gas in this consular district are as below:

Name.	Province.	Population.
Gothenburg	Bohns	200,600
Uddevalla	do	7,522
Venersborg	Elfsborg	5,282
Mariestad	Skaraborg	3,009
Karlstad	Vermland	8,405
Falköping	Skaraborg	2,800
Jönköping	Jönköping	19,496
Helsingborg	Malmöhns	17,465
Malmö	do	47,380
Lund	do	14,759
Ystad	do	7,989
Kintianstad	Kintianstad	10,078
Karlshamn	Bleknige	7,082
Kalmar	Kalmar	11,948

The total number of gas works in the kingdom is 26, the aggregate annual output of which in the year 1887 (the latest statistics) was valued at $589,673.16.

The gas companies are named after the cities in which they are located, as for instance in this city it is called the Gothenburg Gas Works.

It is impossible to obtain the aggregate amount invested in all the gas works in this district, with the other data connected with them, but the gas industry as represented in the city of Gothenburg may be taken as a fair gauge by which to estimate the conditions and extent of its manufacture in other cities. The amount invested here in Gothenburg in gas works was shown on December 31, 1889, to be $133,005.18.

The gas is manufactured in the usual retort furnaces.

The gas is 16 candle power.

The annual output in the city of Gothenburg is about 99,036,000 cubic feet, and during the year 1889, 23.66 per cent was consumed for street and public illumination, 64.79 per cent for private consumption, 10.69

per cent was lost by leakage, etc., and 0.86 per cent was consumed by the gas company itself.

The length of the gas mains on December 31, 1889, was 234,039 feet.

The number of consumers in Gothenburg is 2,500.

The price of gas per 1,000 cubic feet in this city is: for private illumination, $1.2354; for cooking and heating purposes, $0.7691, and for public illumination, $1.0398.

Gas stoves for heating and cooking have not been greatly in use here, but they seem to be growing more popular, especially since the late introduction of new French models.

The wages of those employed in the gas works are 2.75 kronors ($0.737) per day. The hours are from 6 in the morning until 6 at night, with 2 hours intermission at noon.

The material used in the manufacture of gas here is Newcastle (England) gas coal at 17 shillings ($4.14) a ton at the works.

ERNEST A. MAN,
Consul.

UNITED STATES CONSULATE,
Gothenburg, June 19, 1890.

SWITZERLAND.

BERNE.

REPORT BY CONSUL-GENERAL WASHBURN.

The following is the population of cities and towns of Switzerland in which gas is used:

Geneva	52,638	Fribourg	12,239
Basle	70,305	Coire	9,381
Zürich	28,216	Lugana	7,169
Aussersihl	19,912	Thune	5,507
Engi	5,122	Soleure	8,462
Flunteen	3,580	Liestal	4,927
Hirslanden	3,652	Frauenfeld	6,087
Hottingen	6,887	Interlaken	2,028
Oberstrass	4,278	Yverdon	6,330
Riesbach	10,619	Berthoud	6,876
Unterstrass	4,177	Wadensweil	6,346
Wiedikon	4,670	Zug	5,161
Berne	47,151	St. Imier	7,615
St. Gallen	27,842	Neuoeville	2,36[illegible]
Winterthur	15,958	Porrentruy	6,5[illegible]
Vevey	8,144	Delsberg	3,6[illegible]
Lucerne	20,570	Herisau	12,9[illegible]
Chaux de Fonds	25,835	Lausanne	34,[illegible]
Neuchatel	16,504	Nyon	4,[illegible]
Bienne	15,407	Rolle	1,[illegible]
Schaffhouse	12,402	Colombier	1,[illegible]
Glaris	5,401	Payerne	3,[illegible]
Aarau	6,902	Sion	5,[illegible]
Baden	3,887		

As the gas works are the property of the respective cities and towns, the address is simply Gas Works of Geneva, Basle, etc.

The money invested in the gas works at Berne amounts to 1,728,569 francs. From other towns no information could be obtained in regard thereto.

Process of manufacture: Gas is manufactured exclusively in retort stoves. The manufacture of carbonated gas is not known in Switzerland.

It is prescribed here that a gaslight consuming 150 liters per hour must have at least a power of 16 Amplacetats lamps.

Approximate annual output: In 1889 1,872,470 cubic meters gas were produced at Berne.

At the end of 1889 Berne had 1,741 gas-meters for lighting purposes 32 for machines, and 244 for gas stoves; total consumers, 2,027.

Price of gas for illuminating purposes, 25 centimes per cubic meter.

The use of gas stoves is annually increasing. The price of gas for this purpose and machines is 20 centimes per cubic meter.

Wages: Stokers receive from 3.60 to 4 francs for nine hours' work; still their presence is required for twelve hours, of which time they have three hours' idle time.

For the manufacture of gas, Saar (Germany) and St. Etienne (France) coals are now used with Boghead of Autun (France), Tyne Boghead (England), and pitch coal from Bohemia to gain the prescribed light power.

Price of coal at the gas works, Berne: Saar, per hundred kilometers, 3.24 francs; St. Etienne, 3.22; French Boghead, 7.30; Tyne Boghead, 6.50; Bohemian pitch coal, 4.70.

JOHN D. WASHBURN,
Consul-General.

UNITED STATES CONSULATE-GENERAL,
Berne, April 15, 1890.

GENEVA DISTRICT.

REPORT BY CONSUL HEMMICK.

The principal cities and towns using gas in this consular district are Geneva, Lausanne, Vevey, Montreux, and Clarens. The name of the company supplying gas for the city of Geneva is the Compagnie Genévoise d'Éclairage et de Chauffage par le Gaz. The population of the city of Geneva proper is 52,457 people.

Next we have the city of Lausanne, with a population of 33,000 people, which is in the canton Vaud, and it has a gas company, by name the Société Lausannaise d'Éclairage and de Chauffage par le Gaz.

After Lausanne we come to the three towns of Vevey, Montreux, and Clarens, with a combined population of 14,000 inhabitants, and a gas company by name the Société Veveysanne d'Éclairage par le Gaz.

The amount of money they have invested in the various companies is as follows: The company in Geneva, or the Compagnie Genévo-

d'Éclairage et de Chauffage par le Gaz, has 1,250,000 francs, say $250,000 as capital; the Société Lausannaise d'Éclairage et de Chauffage par le Gaz a capital of 700,000 francs; say $140,000; and the Vevey company, the Société d'Éclairage par le Gaz, has the same amount of capital as the Lausanne éompany, viz, 700,000 francs.

The process of manufacture of all these companies is the same, viz, the "oven Lignel system."

The candle power of the gas produced by these companies is 15.4 for the Geneva company, 15 to 16 candle power for the gas produced by the Lausanne company, and the Vevey company about the same, or, as they put it, 7 candles burn 130 liters of gas per hour.

The annual approximate output is stated for 1889 to have been 4,445,817 cubic meters for the Geneva company, 1,180,500 for the Lausanne company, and 900,000 meters for the Vevey, Montreux, and Clarens company.

The Geneva company has 7,710 consumers; the Lausanne company, 1,400; and the Vevey, Montraux company 1,100 consumers.

Price of gas in Geneva is 30 centimes, or say 6 cents, per cubic meter for gas for illuminating purposes, and 20 centimes, or about 4 cents, per cubic meter for gas for heating purposes.

In Lausanne the price is same as in Geneva for gas to illuminate, but 25 centimes, or 5 cents, per cubic meter for heating purposes.

The Vevey, Montreux, and Clarence companies charges are 6.75 francs, or $1.35, per 1,000 cubic feet for lighting, and 5.40 francs, or $1.08, per 1,000 cubic feet for gas for heating purposes.

In Geneva gas stoves are not used on a very large scale for heating and cooking, but it may be of some value and give an idea to know that 3,358 people are among the consumers who have gas meters put into their places which will measure their gas used only for industrial purposes.

In Vevey and Montreux, however, gas stoves are used on a large scale.

Regarding the wages of employés: In all the companies I have named they work ten to eleven hours a day, divided up in the following manner: From 5:30 to 8 o'clock a. m., 8:30 to 12 noon, and then again 1:30 to 6:30 p. m., which complete the eleven hours' labor.

The material used here in Switzerland for the manufacture of gas is coal, which comes from France, Belgium, and England; principally from Houillières de la Loire, Firming and Montrambert, and costs 30 francs $6 per ton. I inclose the last balance sheet of the Lausanne company, which is the only one I couid secure.

ROLAND J. HEMMICK,
Consul.

UNITED STATES CONSULATE,
Geneva, May 3, 1890.

HORGEN DISTRICT.

REPORT BY CONSUL ADAMS.

Most of the towns in this district are lighted by petroleum lamps; one or two, I am told, by electricity. Some of the larger manufactories are lighted by gas made on the premises, usually from petroleum. The following report is confined to the companies which supply gas for public consumption:

GLARUS.

Glarus, canton of Glarus. Population, 5,000.

Name of the company, Aktien-Gesellschaft für Gas-Beleuchtung in Glarus. Capital, 200,000 francs, in 400 shares of 500 francs each; of this, 100,000 francs have been refunded to the shareholders.

Process of manufacture, distillation in ordinary ovens, with 2 to 5 and 4 to 6 retorts. Coke is used for firing.

Candle power, 16 German standard candles.

Annual output, 256,200 cubic meters. Number of consumers, 365.

Price of gas, 26 centimes per cubic meter. Three consumers use the gas for heating; 124 for cooking.

Wages of employés, 3.50 francs; hours of labor, 10.

Material used, Saar coal from, Alsace, costing 34 francs per 1,000 kilograms; Platt coal, from Bohemia, costing 40 francs; Ruhr coal, costing 36 francs; Austral, costing 130 francs.

LOCARNO.

Locarno, canton of Tessin. Population, 2,680.

Name of company, Società Locarnoese per il Gas. Capital, 100,000 francs.

Process, dry distillation.

Candle power, 7 per 150 liters.

Annual output, 45,000 cubic meters. Number of consumers, 60.

Price of gas, 35 centimes per cubic meter for lighting and 25 centimes for cooking. Twenty-five consumers use gas for cooking.

Wages of employés, 75 francs per month; hours of labor, from 12 o'clock to 12 o'clock.

Material used, English coal, imported via Genoa, Italy, costing, delivered, an average of 38 francs per ton.

LUCERNE.

Lucerne, canton of Lucerne. Population, 19,000.

Name of company, Lucerner Aktiengesellschaft für Gasbeleuchtung. Capital, 300,000 francs.

Process of manufacture, dry distillation, in 5 ovens, with 30 retorts, supplying 3 reservoirs.

Candle power, 15 to 16 per 150 liters.

Annual output, 800,000 cubic meters. Number of consumers, 901 (excluding the city and public institutions, not stated).

Price of gas, 25 centimes per cubic meter.

Gas stoves (Wobbé & Fletcher system) are largely used for cooking, but not for heating.

Wages of employés, 3.80 to 4.40 francs; hours of labor, 10.

Material used, English, Scotch, German, Belgium, and Bohemian coal, delivered at the works at an average cost of 33 francs per ton.

LUGANO.

Lugano, canton of Tessin. Population, 7,500.

Name of company: Officina del Gas di Lugano; capital, 200,000 francs.

Process of manufacture: Dry distillation in 3 ovens, each 11 retorts (one of 5 retorts, two of 3).

Candle power: 14 per 150 liters.

Annual output: 168,000 cubic meters; number of consumers, not stated; number of jets supplied, 1,234.

Price of gas: For lighting, 35 centimes per cubic meter; for cooking, 25 centimes.

Gas is used for cooking, but in what quantities is not stated.

Wages of employés, 75 francs per month; hours of labor, 10.

Material used: Coal, mostly English, delivered at the works at an average cost of 38 francs per ton.

THALWEIL.

Thalweil, canton of Zurich; population, 4,000.

Name of company: Gas-Gesellschaft von Thalweil; capital, 55,000 francs.

Process of manufacture, not stated.

Candle power: 30 liters give 6½ German standard candles per hour.

Annual output: 40,000 cubic meters; number of consumers, 56, and 48 public lamps.

Price of gas: 55, 70, and 80 centimes per cubic meter, according to quantity consumed. Each street lamp, including attendance, 40 francs per annum.

Gas is used for 8 machines, 3 baths, and 6 cooking stoves.

Wages of employés not stated; hours of labor, 8 to 15.

Material used: Gas-oil, 13.90 to 18 francs per 100 kilometers; stove coal, 3.55 to 4.10 francs per car load.

WAEDENSWEIL.

Waedensweil, canton of Zurich; population, 8,000.

Name of company: Aktien-Gesellschaft für Gas-beleuchtung.

Number of consumers, 173; price of gas, for lighting, 8.49 francs; for heating, 7.07 francs per 1,000 cubic feet.

No answer having been received from this company, other statistics are wanting.

ZUG.

Zug, canton of Zug; population, 5,000.

Name of company: Gas-Austabt von Zug; capital, 50,000 francs.

Process of manufacture: Dry distillation in 3 ovens, 7 retorts.

Candle-power: 12.

Annual output: 86,000 cubic meters. Number of consumers: 1,580 gas-jets are supplied.

Price of gas: 28½ centimes per cubic meter.

A certain number of gas stoves for cooking are furnished with gas.

Wages of employés: 3.80 francs per day of 10 hours.

Material used: Saarbrink, Bohemian, and Scotch coal, delivered at an average price of 35 francs per ton at the works.

LYELL T. ADAMS,
Consul.

UNITED STATES CONSULATE,
Horgen, May 20, 1890.

ST. GALL DISTRICT.

REPORT BY CONSUL ROBERTSON.

ST. GALL.

St. Gallen, canton of St. Gallen; population, 27,842.

Name of company: Gas ünd Wasser-Werke, St. Gallen. Capital invested, 1,240,000 francs for the gasworks; 1,000,000 francs for the waterworks.

Process of manufacture: The ordinary distillation from pit coal.

Candle power: 18 candles per 150 liters of gas.

Annual output: 1,800,000 cubic meters. Number of consumers, 1,550.

Price of gas: 8.50 francs for lighting; 6.80 francs for heating, cooking, and industrial purposes.

Gas stoves are not largely used; 44 customers for gas motors, and 108 for gas stoves for cooking and heating.

Wages: 3.60 to 4.50 francs per day of ten hours.

Material used: 5,550 tons of pit coal, from Saargebiet and Belgium, costing at gasworks 35 francs per ton; 75 tons of boghead, from Australia and Scotland, costing 130 francs per ton at gasworks; 70 tons of cannel coal, from Scotland, costing 61 francs per ton at gasworks.

RORSCHACH.

Rorschach, canton of St. Gallen; population, 5,867.

Name of company: Gasaustalt der Vereinigten Schweizerbahnen in Rorschach. Capital invested, 76,240 francs.

Process of manufacture: Ordinary distillation from oil in redhot retorts.

Power: 16 candles for 50 liters of gas.

Annual output: About 50,000 to 55,000 cubic meters.

Consumers: 69 customers besides the town and railway (United Swiss Railroad).

Price of gas: 1 franc per cubic meter, with rebate of 25 per cent.

Gas stoves are not used.

Wages: 38 centimes per hour; hours from 11 to 12 per day.

Material used: Saarcoaks, costing 48 francs, free Rorschach.

HERISAU.

Herisan, canton of Appenzell (Aussershoden); population, 12,972.

Name of company: Herisauer Aktiengesellschaft für Gasbeleuchtung. Capital invested, 90,000 francs.

Process: Ordinary distillation from coal.

Candle power: Not known, as company has no photometer.

Annual output: 283,200 cubic meters.

Number of consumers: About 150.

Price of gas: 25 centimes per cubic meter.

Few gas stoves and cooking apparatuses; generally not liked.

Wages from 4 to 5 francs per day of 11 hours.

Saar coal, 365 francs; English boghead, 732 francs; Australian boghead, 1,405 francs; per wagonload of 10 tons.

CHUR.

Chur, canton of Graubünden; population, 9,381.

Name of company: Actiengesellschaft für Gasbeleuchtung der Staadt Chur. Capital invested: 200,000 francs.

Process, distillation from pit coal.

Candle power not given by manufacturer.

Annual output, 190,000 cubic meters.

Number of consumers, 250.

Price of gas, 8.40 francs per 1,000 cubic feet.

Gas stoves for heating, none; for cooking, 10; motors, 3.

Material used: Saar coal, 4.10 francs; English boghead, 8.50 francs; per 100 kilograms at gasworks.

FRAUENFELD.

Frauenfeld, canton of Thurgau: Population, 6,087.

Name of company: Gasbeleuchtungs-Gesellschaft Frauenfeld. Capital invested, 160,000 francs.

Process: Ordinary distillation from coal.

Candle power: 14 candles for 125 liters of gas.

Annual output, about 90,000 cubic meters.
Number of consumers, 169.
Price, about 24 centimes per cubic meter.
Gas stoves: For heating, 3; for cooking, about 60.
Wages, 3.70 francs per day of twelve hours.
Material used: Saar coal, 320 francs per 10,000 kilograms; Bohemian coal, 365 francs per 10,000 kilograms; freight and duty included.

W. HENRY ROBERTSON,
Consul.

UNITED STATES CONSULATE,
St. Gallen, May 6, 1890.

ZURICH DISTRICT.

REPORT BY CONSUL CATLIN.

The three cities manufacturing and consuming coal gas in this consular district are Zurich (95,000), Winterthur (16,000), and Schaffhausen (12,000). In the two first-named cities, the gas companies are controlled by the corporation and have no individual names. In Schaffhausen the manufacture is conducted by a company known as Die Schweizerische Gasgesellschaft, which has its headquarters there, and also branch factories in Burgdorf, Canton Berne; in Reggio and Pisa, Italy, and in Loerrach, Schopfheim and Todtnau, Baden.

VALUE OF PLANTS.

In the city gas works of Zurich there is invested a capital of 1,600,000 francs. This covers the plant at the main works in Ausser-sihl, together with that of the branch works in Riesbach, one of the outlying towns.

The main plant embraces 60 retorts, ⊓-formed (2.5 by .57 by.37 meters each), distributed in 10 ovens, with 6 retorts each; 4 air condensers (4.9 meters high, with 136 quadrate meters cooling surface, outer pipe 1.05 meters, inner .84 meters wide); 3 washers (5 meters high, 1.35 meters diameter); 1 condenser with a capacity of 14,000 cubic meters in twenty-hours; 1 Beale exhauster with regulator, and 1 steam jet exhauster; 2 regulators, 2 steam engines, 2 steam boilers, and a two-horse gas-power engine; 3 cleansing machines (6 meters long and 3 meters wide, cleansing made with oxide of iron); 2 station gas meters, with a joint capacity of 500 cubic meters per hour, and 3 gas receivers, containing in all 9,330 cubic meters.

The plant at Riesbach embraces 4 ovens with 16 retorts, 2 large washers also serving as condensers (4 meters high, 1.5 meters wide), 1 steam-jet exhauster; 3 cleansers (3.5 meters long, 1.75 wide); 1 station

gas meter, with a capacity of 110 cubic meters per hour; 1 regulator, 1 gas receiver containing 1,130 cubic meters, and 12 gas motors, aggregating 61 horse power.

The Winterthur plant represents, in actual cost, inclusive of pipes and gas lamps, an outlay of 1,375,000 francs. There are 5 ovens with 5 retorts each (5 oval and 20 in ⌂ form). The heads of the retorts are provided with self-sealing covers of the Giroud system; the tubes are of cast iron, and 150 millimeters in diameter. Each oven has its own receiver with a conduit 100 millimeters in diameter, connecting with the main tube, 225 millimeters distant from and behind the oven. The conduit from the main tube to the condenser is 36 meters long and 225 millimeters in diameter, and the condenser consists of 10 vertical tubes, each 3 meters in length and 225 millimeters in diameter, together with elbows, and a large tar-chest. The entire cooling surface is about 45 quadrate meters. There are also 3 cast-iron washers (3.5 meters high and 1.5 meters in diameter), each provided with 5 coke burners and an irrigating apparatus; 3 cast-iron cleansers (5 meters long, 3 wide, deep), with sheet-iron covers; 1 condensing apparatus, with a capacity of 6,000 cubic meters in twenty-four hours; 1 steam-jet exhauster, with a capacity of 6,300 cubic meters in the same period; 1 gas-production meter, with a maximum capacity of 200 cubic meters per hour; 2 receivers with walled basins, each with a capacity of 1,700 cubic meters; 1 regulator for a pipe of 300 millimeters diameter, connecting with the city of Winterthur; another for a pipe of 180 millimeters diameter, connecting with the village of Toess; and 10 gas motors, aggregating 1 horse power. The combined piping has an aggregate length of 22,61 meters, varying from 40 to 300 millimeters in diameter.

The Schaffhausen plant is valued at 425,000 francs, and comprises generator ovens, with 18 self-sealing retorts; 1 exhauster; 1 condenser, with 16 tubes of 125 millimeters diameter; 2 scrubbers, 1 condenser, cleansers, 1 station gas meter, 1 station regulator with water pressure, 3 receivers, with a capacity of 1,388 cubic meters; 1 apparatus for making ammonia, 7 gas motors, and 22,545 meters of piping, varying from 20 to 250 millimeters in diameter.

CANDLE POWER.

The minimum power prescribed at the Zurich gas works is that of 1 candles with a flame 50 millimeters high, to an hourly consumption of 110 liters of gas. The candles referred to are what are known as "German Normal" candles. The average power, however, is that of 12¼ or 12½ candles. In Winterthur, the minimum is fixed at 16 candles; in Schaffhausen at 12, to an hourly consumption of 125 liters. City experts may at any time, by use of the photometer, examine and control the power of the gas supplied.

ANNUAL OUTPUT.

The following table shows the product of the works at Zurich and Winterthur, respectively, for the fiscal year 1888–'89, viz:

	Zurich.	Winterthur.
Gas produced ..... cubic meters..	3,255,600	861,400
Coke produced ..... kilograms..	6,891,000	1,771,000
Tar produced ..... do...	677,500	170,600
Ammoniac ..... do...	55,000	14,800
Outlay for distilling materials ..... francs..	344,500	81,500
Receipts for gas ..... do...	763,600	184,900
Receipts for other products ..... do...	161,400	57,700
Total receipts ..... do...	925,000	242,600

The annual products of the works at Schaffhausen amounted in 1884, the latest date I find reported, to 319,922 cubic meters of gas, 625,710 kilograms coke, 70,641 kilograms tar, and 9,527 kilograms of ammoniac.

NUMBER OF CONSUMERS.

The extent to which gas is consumed in the three cities covered by this report is shown by the following table, viz:

	Zurich.	Winterthur.	Schaffhausen.
Gas meters	3,066	950	404
Street burners	1,386	294	281
Private burners	23,259	.....	7,830
Consumption, public lighting ..... cubic meters..	574,300	71,900	50,713
Consumption, private lighting ..... do...	2,182,000	557,800	228,677

PRICE OF GAS.

The price of gas per 1,000 cubic feet English measurement (equivalent to 28.3 cubic meters), as follows:

	Zurich.	Winterthur.	Schaffhausen.
	Francs.	*Francs.*	*Francs.*
For illuminating gas	8.21	7.07	7.07
For heating gas	6.79	5.66	5.66

In Zurich, large consumers have the benefit of a reduction of 3 per cent on 1,500 cubic meters, 4 per cent on 3,000, 5 per cent on 4,500, 6 per cent on 6,000, and 8 per cent on 10,000 of yearly consumption. Government buildings have a rebate of 12 per cent and the railway station pays 23 centimes per cubic meter.

In Winterthur, the reductions on large quantities are as follows: From 1,000 to 5,999 cubic meters, 5 per cent; from 6,000 to 6,999, 6 per cent; from 7,000 to 7,999 cubic meters, 7 per cent; from 8,000 to 8,999, 8 per cent; from 9,000 to 9,999 cubic meters, 9 per cent, and from 10,000 to

The second company is a Belgian-German concern, which obtained the necessary concession from the Turkish Government about two years ago, and is called Société Ottomane pour l'Éclairage de la ville de Constantinople. This company has established a factory at the Seven Towers, on the sea of Marmora, and has the privilege of supplying gas only to the other side of the city of Constantinople, properly called Stamboul, which is largely inhabited by the Turks, including the suburb of Eyoub, in the Golden Horn.

It is impossible to ascertain the amount of money invested in the industry by the first Government company. The amount invested by the second, the Belgian-German company, is $729,975.

Process of manufacture: The factory of the Belgian-German Company was constructed by Mr. Kloenne de Dortmund. It has a gasometer of 12,000 cubic meters, with furnaces, and 4 batteries with 8 retorts each. The other machinery is in proportion. The machinery hall is 90 meters long by 15 meters wide; the furnace hall is also 90 meters long by 15 meters wide.

Brilliancy of gas, 12 to 14 candles.

The approximate annual output is 1,000,000 cubic feet in Stamboul, and 3,000,000 cubic feet in Pera and Galata.

Number of consumers: The Belgian-German company has about 10,000 to 12,000 flames for the present. No statistics can be obtained from the Government company.

The price of gas per 1,000 cubic feet is $1.76, with 25 per cent discount for public fixtures.

The use of gas stoves for heating and cooking is quite limited.

The wages of the employés of the Belgian-German company range as follows: Director, $4,825 per annum; chief engineer, $3,281; quartermaster, $799; other employés, $193. The hours of labor are about twelve, with recesses two or three times during the day or night.

The material used is English Newcastle and Cardiff coal. The price is $6.33 to $6.57 per ton.

Z. T. SWEENEY,
Consul-General.

UNITED STATES CONSULATE-GENERAL,
Constantinople, June 18, 1890.

UNITED KINGDOM.

AUTHORIZED GAS UNDERTAKINGS OF THE UNITED KINGDOM.

[From Parliamentary returns other than those of local authorities.]

Comparative table.

Year.	Authorized undertakings included in return.	Total share capital authorized.	Total share and premium capital paid up.	Total loan capital authorized.	Total loan capital issued.	Authorized capital subject to auction clauses.	Capital sold under auction clauses by auction or tender.	Premium realized by sales of shares under said auction clauses.
82..	352	£38,184,393	£28,589,148	£8,722,308	£4,345,787	£8,598,290	£2,065,905	£957,561
83..	357	39,060,992	29,038,726	9,092,993	5,075,804	9,339,760	2,538,709	1,088,675
84..	361	39,575,330	29,594,464	9,395,859	5,330,550	9,660,620	2,810,415	1,188,750
85..	364	39,697,146	30,109,429	9,394,231	5,404,141	9,758,755	3,088,460	1,306,238
86..	377	40,403,128	30,960,026	9,569,681	5,679,830	10,473,755	3,209,564	1,393,773
87..	384	41,276,178	31,556,788	9,743,715	5,839,792	11,006,190	3,354,093	1,473,656
88..	395	41,309,978	31,736,024	9,741,514	6,002,510	11,163,940	3,488,588	1,517,902

Year.	Receipts.	Expenditure.	Tons of coal carbonized.	Cubic feet of gas made.	Cubic feet of gas sold.	Length of gas mains in miles.	Consumers.	Public lamps lighted.
82..	(*)	(*)	4,928,695	49,360,289,059	45,484,910,194	(*)	1,055,009	224,300
83..	(*)	(*)	5,171,963	52,330,740,963	47,808,265,546	†11,914½	1,091,388	235,338
84..	(*)	(*)	5,361,576	54,452,255,864	49,904,217,135	†12,421	1,102,628	242,782
85..	(*)	(*)	5,595,371	56,903,060,785	52,192,002,288	§12,806	1,115,223	250,404
86..	(*)	(*)	5,777,966	59,051,111,814	54,309,760,430	‖13,156½	1,133,897	258,072
87..	£10,433,523	£7,143,083	5,977,254	61,266,055,857	56,240,641,312	¶13,510½	1,152,119	264,316
88..	10,534,721	7,101,974	6,050,588	62,328,542,470	57,475,515,329	**13,615½	1,103,198	259,921

(*) No information.
‖ In 33 returns this information was not given.
¶ In 23 returns this information was not given.
† In 46 returns this information was not given.
§ In 28 returns this information was not given.
¶ In 20 returns this information was not given.
** In 9 returns this information was not given.

BELONGING TO LOCAL AUTHORITIES.

Comparative table.

Year.	Authorised undertakings included in return.	Loan and capitalized value of annuities authorized.	Borrowed, including annuities (not deducting amount repaid).	Loan repaid, annuities redeemed, and amount placed to sinking fund.	Receipts in respect of gas undertaking during the year.	Expenditure for the year (exclusive of amount in next column).	Interest paid on loan, and other items as in column 14 of this return.
[illegible]	148	£20,911,154	£17,926,183	£2,283,005	£4,098,828	£2,759,304	£815,936
[illegible]	148	21,163,139	17,874,351	2,529,691	4,252,296	2,877,732	873,921
'85..	153	21,958,655	18,758,895	2,877,490	4,334,059	3,066,386	894,836
'86..	160	22,771,890	19,619,416	3,172,755	4,348,105	3,117,989	901,773
'87..	162	23,096,861	19,723,046	3,583,355	4,403,262	3,127,047	951,636
'88..	168	23,269,702	20,081,435	3,829,209	4,495,093	3,161,604	923,157
'89..	173	24,780,302	21,338,833	3,965,001	4,817,269	3,375,197	977,154

Comparative table—Continued.

	Net profit after payment of items in preceding column.	Tons of coal carbonised.	Cubic feet of gas made.	Cubic feet of gas consumed.	Length of gas mains in miles.	Consumers.	Public lamps lighted.
1882	£510, 268	2, 852, 062	23, 223, 054, 342	21, 129, 033, 704	(*)	916, 962	137, 011
1883	524, 010	2, 459, 341	24, 507, 217, 850	22, 308, 058, 516	5, 653½	928, 458	140, 198
1884–'85..	309, 714	2, 642, 942	26, 120, 491, 840	23, 813, 678, 379	5, 840½	955, 728	144, 506
1885–'86..	355, 469	2, 783, 533	27, 734, 666, 850	25, 201, 667, 909	6, 161½	979, 802	151, 670
1886–'87..	359, 532	2, 879, 765	28, 880, 425, 240	26, 370, 710, 862	6, 287	996, 480	155, 849
1887–'88..	430, 467	2, 985, 577	30, 105, 457, 962	27, 418, 049, 872	6, 602½	1, 011, 139	159, 264
1888–'89..	479, 489	3, 204, 982	32, 381, 124, 770	29, 547, 773, 376	7, 508½	1, 089, 748	174, 191

*No information.

THE GAS INDUSTRY OF GREAT BRITAIN.

*TRANSMITTED BY CONSUL WIGFALL, OF LEEDS.**

The following abstract, collated from the last edition of the Encyclopedia Britannica, 1879 (article gas), with some of the details concerning gas production in Great Britain, may be of interest in reply to the queries set forth in State Department circular of February 15, 1890:

The beginning of the use of gas as an illuminant in Great Britain is connected with the name of a Scotchman, Robert Murdoch. As early as 1667 (in the Royal Society's Transactions), T. Shirley notes a burning spring in the coal district of Wigan. Previously to 1691 Rev. J. Clayton had experimented with the distillation of coal in a retort and the collection of the gas in bladders. More precise statements appear in the work on vegetable statistics, by Dr. S. Hales, in 1726. In 1787 Lord Dundonald used gas for lighting at Culross Abbey. In 1792 Robert Murdoch, then at Redruth, Cornwall, began his investigations. Within five years he had sufficiently advanced to be able publicly to show a system. A year later he partly lighted Boulton & Watts's works at Birmingham. The first public company for gas lighting was formed by F. A. Winsor. Act of Parliament for the Gaslight and Coke Company was obtained by him in 1810. The Lyceum Theater had been lighted with gas by his efforts in 1803. Westminster Bridge was first lighted with gas in 1813, and in 1816 gas was in common use in London.

Illuminating gas may be produced from a variety of materials, *e. g.*, coal, shale, lignite, petroleum, turf, wood, resins, oils, fats, etc., as also by carburetting other nonluminiferous gases. None, however, can compete for general purposes with coal gas, when the raw material is conveniently to be had.

For the manufacture of gas there is a wide range of difference in coals. Those of the bituminous class are the only really good ones. Anthracite is a natural coke from which the volatile constituents have been already driven off. Lignite carries too much oxygen and water. The useful bituminous coals are: (1) Caking or pitch coals; (2) cannel or parrot coals.

These, too, vary within wide limits as to gas making value; first, as to yield of gas in quantity; second, as to illuminating value of the gas yielded. As a rule, the larger the quantity yielded the better is the illuminating quality. Cannel or "gas coals" abound chiefly in Scotland and Lancashire. The chemical analysis of coal is very elusive as regards gas making; experiment only is satisfactory.

H. Fleck says coal for gas making should contain, to 100 parts of carbon, 6 parts of hydrogen, of which 4 parts are available for hydrocarbon compounds. Coals for gas making should be as free from sulphur as possible. For cooking the ash should

*Consul Wigfall's report proper will be found under "West Riding of Yorkshire."

be small, and the proportion of oxygen low, in order to avoid extracting hydrogen to form watery vapor. Coal for gas making should be protected from the weather. Rain and sunshine are injurious to it.

The following analysis may be taken as showing the gas-yielding properties of some typical examples of coal:

Variety of coal.	Disposable hydrogen.	Carbon.	Hydrogen.	Nitrogen.	Sulphur.	Oxygen.	Ash.
Newcastle Pearth gas coal	.....	82.42	4.82	.....	0.86	11.11	0.79
Blaydon Main, Tyne side	6.88	78.06	5.80	1.85	2.22	3.12	8.34
Dukinfield, Ashton-under-Lyne	6.19	83.25	5.75	.....	0.86	5.06	3.48
Wigan cannel	5.65	84.07	5.71	.....	.....	7.82	2.40
Mold-Leeswood green cannel	.....	77.81	8.47	.....	0.71	6.32	.....
Scotland:							
Boghead cannel	12.68	63.10	8.91	.....	0.96	7.25	19.78
Methil brown shale	9.33	66.44	7.54	1.36	0.84	10.84	12.98
Kelty Gin seam	.....	76.50	5.03	.....	0.94	11.68	2.25

Products of distillation of one ton of coal.

	Gas.	Coke.	Tar.	Ammoniacal liquor.	Illuminating power, in candles.
	Cu. ft.	*Pounds.*	*Pounds.*	*Pounds.*	
Newcastle cannel	9,883	1,426	98.3	60.0	25.2
Wigan cannel	10,850	1,332	218.3	161.6	19.4
Boghead cannel	13,334	715	733.3	*nil.*	46.2

PRODUCTS OF DISTILLATION OF COAL AT HIGH RED HEAT.

1. Illuminating gases.

Gases:
- Acetylene C_2H_2.
- Ethylene C_2H_4.
- Propylene C_3H_6.
- Butylene C_4H_8.

Vapors:
- Benzol C_6H_6.
- Naphthalin $C_{10}H_8$.

Diluents:
- Hydrogen H.
- Light carburetted.
- Hydrogen CH_4.
- Carbonic oxide CO.

Impurities:
- Carbonic acid CO_2.
- Ammonia NH_3.
- Cyanogen C_2N_2.
- Bisulphide of carbon CS_2.
- Sulphuretted hydrogen H_2S.
- Oxygen O.
- Nitrogen N.
- Aqueous vapor H_2O.

2. Components of tar.

Liquid hydrocarbons:
- Benzol C_6H_6.
- Toluol C_7H_8.
- Cumol C_9H_{12}.
- Cymol $C_{10}H_{14}$.

2. Components of tar.—Continued.

Solid hydrocarbons:
- Naphthalin $C_{10}H_8$.
- Anthracene $C_{14}H_{10}$.
- Pyrene $C_{16}H_{10}$.
- Crysene $C_{18}H_{12}$.

Carbolic acid C_6H_6O.
Cresylic acid C_7H_8O.
Rosalic acid $C_{20}H_{16}O_3$.
Pyridine C_5H_5N.
Aniline C_6H_7N.
Picoline C_6H_7N.
Lutidine C_7H_9N.
Collidine $C_8H_{11}N$.
Leucoline C_9H_7N.

3. Ammoniacal liquor.

Ammonium carbonate $2NH_4CO_3$.
Ammonium sulphydrate NH_4HS.
Ammonium sulphocyanate NH_4NCS.
Ammonium cyanite NH_4NCS.
Ammonium chloride NH_4Cl.

4. Coke and ash in retort.

The proportion in which coal yields these products may be indicated by the case of a cannel giving off 11,000 feet per ton of gas of a density of 0.600. From 100 parts of such coal there would be yielded—

Gas	22.25
Tar	8.50
Ammonia	9.50
Coke	59.75
	100.00

The proportions and even the nature, of these products of distillation are modified by the temperature at which distillation is effected. Low red heat gives a small proportion of noncondensible gas, but a large one of heavy hydrocarbon oils; whence it comes that distillation of shales and of coal in paraffin manufacture is at a low red heat.

With excessive heat the compounds became simpler chemically; carbon is deposited; hydrogen is given off; and gain in amount of gas produced is more than counterbalanced by its poor illuminating properties.

Of gases and vapors from the retorts highly heated some part (tarry matter and ammoniacal liquor) precipitates by cooling. Other injurious constituents must be removed by a system of purification. What thereafter goes as ordinary gas for consumption still has some percentage of incombustible matters, aqueous vapor, oxygen, nitrogen, and carbonic acid.

The combustible portion also has two classes:

(1) Nonluminous combustible: Hydrogen, marsh gas (light carburetted hydrogen), and carbonic oxide.

(2) Luminiferous combustible: Hydrocarbon gases, acetylene, ethylene (olefiant gas or heavy carburetted hydrogen), propylene, butylene, and vapors of the benzol and naphthalin series.

It was formerly the habit to regard heavy carburetted hydrogen (ethylene and its homologues) as the measure of the illuminating power of a gas. Berthelot, however, has pointed out that such compounds exist in small proportion in some gas of good luminous quality. Paris gas, by Berthelot's analysis, has a mere trace of acetylene, ethylene, and other hydrocarbons, with 3 to 3¼ per cent of benzol vapors.

It has been subsequently proved by Dittmar that three volumes of hydrogen to one volume of ethylene yields little more light than marsh gas, while benzol vapor to the extent of only 3 per cent in hydrogen gives brilliant flame.

Frankland and Thorne give for 1 cubic foot of benzol vapor burnt for one hour in various combinations with hydrogen a light of 69.71 candles; with carbonic oxide, 73.38; with marsh gas, 92.45; with marsh gas (second series), 93.94.

It is thus highly probable that the illuminating value of coal gas depends on benzol vapor more than on heavy gaseous hydrocarbons. The proper estimation of benzoi seems to have been comparatively neglected. Water readily dissolves benzol out of gas—a point of importance. If benzolated hydrogen with 6 per cent of benzol vapor is shaken up with water the percentage of vapor is reduced to less than 2 per cent.

The average composition of London gas is given:

	12 candles, ordinary gas.	20 candles, cannel gas.
Hydrogen	46.0	27.7
Light carburetted hydrogen	39.5	50.0
Condensible hydrocarbons	2.8	13.0
Carbonic oxide	7.5	6.8
Carbonic acid	0.6	0.1
Aqueous vapor	2.0	2.0
Oxygen	0.1	0.0
Nitrogen	0.5	0.4
	100.0	100.0

Cannel gas, in 1879, was supplied only to certain Government buildings.

MANUFACTURE OF COAL GAS.

The series of operations embraces distillation, condensation, exhaustion, scrubbing, purification, measuring, storing, distribution by governor to the main, and supply to consumers by them.

Pressure of the gas, measurement, and the burners and other arrangements are important considerations.

Retorts may be of cast iron, clay, brick, or wrought iron.

Various shapes are made, and there are also different modes of disposing them in the furnace. At first they were set vertically, but afterwards a horizontal position was preferred as more convenient. Clay retorts are placed to allow the fire to play freely round them. Retorts now in use have elliptical and similar shaped section; sometimes D shaped is used. It is not unusual to combine in one furnace or bench retorts of different shapes. Single retorts are from 6 to 9 feet long; double retorts 19½ feet, and charged from both ends.

Hislock's brick retorts are made of fire clay ∩ shaped, 9 feet by 22 inches by 13½ inches, and are set four in one oven. Each retort is calculated to carbonize 500 tons of cannel, or 2,000 tons per oven, at a cost of about one-eighth of a penny per 1,000 cubic feet of gas generated, as against 1 penny for molded and 7 pence for iron retorts (roundly, one-quarter of a cent, 2 cents, and 14 cents).

The number of retorts in a furnace varies from 1 to 15; there are usually from 4 to 7.

Gas coal for charging is broken into 1 pound pieces or thereabouts.

The furnaces are commonly fired with a portion of the coke produced; but where shale and rich cannel coals are used, commonly coal must be had for burning. In France gas is used somewhat on the Siemens system.

Charging and drawing are done by manual labor, with shovels and rakes. Some semicylindrical scoops are used in the larger works, a little shorter than the retort, and overturned after pushing into place inside.

Mechanical attempts at charging have had slight success.

The retorts are kept at a bright red heat. For coal with a high percentage of volatile matter a higher temperature is required than for one less rich in gas.

Retorts nearest the furnace fire need more frequent drawing to prevent overburning the coke and giving off sulphur compounds.

From the retort the gas passes to a hydraulic main, where the tar is condensed, together with some ammoniacal liquor. An arrangement of liquid matter cuts off the gas and prevents its escaping; when one retort is opened to draw and recharge, the others continue in operation. The tar overflows from the main and is carried to the tar well by a pipe.

Leaving the hydraulic main, the gas is still at a temperature of 130° to 140°, and bears with it heavy hydrocarbons, which as the temperature falls would be deposited. These are to be separated; which is done by a condenser, cooling the gas to nearly a parity with the outer air. This is effected by passing the gas through pipes and over water. Water is sometimes run over the exterior of the pipes. The tar and ammoniacal liquor condense, the tar going to the bottom, the liquor remaining on top; and as they accumulate both flow off into the tar tank.

Rapid cooling is objected to as losing part of the illuminating power, a proportion of the light hydrocarbons; and a system is spoken of by which the cooling takes place gradually in an "analyzer" partially heated.

The gas, on this plan, enters the heated portion and deposits the heavy part of the tarry matter in the lower chambers, ascending and cooling gradually, depositing at the same time the lighter fluids and also being subjected to the purifying action of the previously deposited light hydrocarbons.

Considerable obstructions are interposed to the progress of the gas in connection with the subsequent purifying and storing in the gas-holders. This, if not obviated, would result in pressure at the retort. An exhauster, accordingly, is employed to

relieve this pressure, which improves the quality, and moreover increases the volume of the gas by about 10 per cent. The exhauster is controlled by a governor to check too rapid action; and there are "pass-by" valves for use in case of stoppage. Many methods of exhaustion have been employed since the process was introduced in 1839; as, for example, rotary with fan motion, the injector principle, and piston exhaustion, exhausting gas with both up and down strokes.

Purification removes ammonia, sulphuretted hydrogen and carbonic acid with other sulphuric and cyanogen compounds.

Agencies partly mechanical and partly chemical are employed for purification.

Ammonia is separated in the scrubber and purification is completed in the purifier.

Wet purifying is not now used, except in small works, as it loses the ammonia and makes a troublesome product (blue-billy) which is hard to get rid of.

The scrubber is used in order to get out the ammoniacal gases with a large amount of gas and the smallest possible amount of water, to obtain a strong ammoniacal liquor from the scrubber, and to avoid as far as may be acting on the heavy hydrocarbons, which are also soluble in water.

The scrubber is a hollow column, vertically divided in two, filled with coke or with perforated iron plates, or with layers of thin deal boards, or other device. The gas, passing up one side and down the other, meets a stream or shower of weak ammoniacal liquor, which by this contact becomes stronger from the gas until sufficiently saturated for making ammonia sulphate.

The lime-purifiers, by which sulphuretted hydrogen and carbonic acid are abstracted from the gas, are rectangular vessels with trays arranged inside made like grids and covered with slightly moistened slaked lime, 6 inches deep and with three to six tiers in a purifier. The gas is passed into the purifier and over these lime trays and thence out into the next purifier. There are four purifiers in a set, three being in use and one kept in reserve to allow for renewing.

The oxide method is also employed. Hydrated oxide of iron decomposes sulphuretted hydrogen, the sulphur forming a sulphide with the iron. Quicklime is also used to separate carbonic acid. Oxide of iron is mixed with sawdust or with cinders in order to increase contact. The mixture after use being exposed to the air by opening the purifier, renews its virtue and is used over again. The dry lime process is next applied for separation of the carbonic acid. The gas is now ready for use, and is sent on through the station meter to be registered and stored in the gas-holders.

The following table shows the composition of the gas at the various stages, 1,000 cubic feet.

	From condenser.	From scrubber.	From purifiers.	
			Iron.	Lime.
Hydrogen	380	380	380	380
Marsh gas	390	388	403	394
Carbonic oxide	72	71	39	30
Heavy hydrocarbons	42	46	46	43
Nitrogen	48	50	79	100
Oxygen	3	5	5	6
Carbonic acid	40	39	33	4
Sulphuretted hydrogen	15	15	3	.....
Ammonia	10	5	.....	.....
	1,000	999	988	957

At best there is a discrepancy of from 7 to 8 per cent between the amount of gas made and the amount consumed, which is largely due to leakage from the street pipes.

Residual products embrace coke, ammoniacal liquor, and gas tar; all of them sources of income. Residuals, indeed, can hardly be deemed of secondary importance. Their production will bear materially on the competition of gas with other methods

of illumination. Shale leaves worthless ashes. Cannel leaves coke of little good. Coking coal gives coke of high value. After heating the retorts, there is left 65 to 85 per cent of the coke to sell.

More ammoniacal liquor comes from cannel than from coking coal. The proportion is about 18 to 22 pounds of ammonia as sulphate per ton of cannel against about 16 pounds from ordinary coal.

Gas liquor is the chief source of ammonia, which is largely used for agricultural fertilizing. Tar liquor gives a wide range of valuable products. Cannel coals and other similar yield most tar.

In the distillation of coal tar ammoniacal and watery vapors are first given off, and next a proportion of highly volatile fluid hydrocarbons, principally benzol; afterward comes a large amount of a light oil, coal naphtha (also a mixture of various hydrocarbons), leaving as a residue "artificial asphalt," which is an article of commerce. With distillation continued a considerable quantity of "heavy" or "dead oils" is obtained with a residue of "hard pitch." The heavy oils are a mixture of naphthalin, phenol (carbolic acid), cresol (cresylic acid), anthracene, etc. The benzol in the first stage is the basis of aniline and its various dyes. Naphtha is used as a solvent, and for lighting, etc. Carbolic acid is an antiseptic and the basis of many valuable dyes. Anthracene is the source of an important dye, artificial alizarine. Most of the substances have other applications of minor importance.

The following summary statements have been derived in part from official publications, but information has also been obtained from replies to direct inquiry. The most recent parliamentary publications of returns for gas undertakings (local authorities, and other than local) are appended to this report. These, as a rule, cover the years ending, as the case may be, at various dates of 1888 and 1889.

There also accompanies this report an interesting compilation, to which attention is especially invited, viz, the analyses of the accounts of gas companies and corporations, wherein a minute repartition is entered on, and many details of outlay and income rendered per ton and per 1,000 cubic feet, with statement of proportion of lost gas, etc.

These details are from operations on every scale of magnitude, from the Pontefroct Gas Company, with its annual carbonization of under 3,000 tons, to the Gaslight and Coke Company of London, with nearly 1,800,000 tons per annum.

THE ENGLISH COAL FIELDS AND WATER GAS.*

REPORT BY CONSUL WIGFALL, OF LEEDS.

The following article is taken from a recent issue of the Yorkshire Post, a leading provincial newspaper published at Leeds, and gives details of the English coal production during the year 1888, with a comparison for the preceding year. Reference is also made to the very interesting question of the reserve supply of coal and the rate at which the current demands are intrenching on its volume.

PRODUCTION OF COAL IN 1888.

A correspondent sends us the following:

The official return of the output of coal in the United Kingdom and Ireland has just been issued, and the prominent part it plays in the manufacturing industries, not only of this locality, but in general, should cause some interest to be taken in its progress. Those interested in the trade of the country may be somewhat surprised

*Republished from Consular Reports No. 105.

that such a large increase as 7,815,407 tons took place last year, the output for 1888 being 169,935,219 tons against 162,119,812 tons in 1887, the increase, in fact, being at the rate of 4.8 or nearly 5 per cent, a much heavier increase than under the condition of trade generally might have been expected. If the coal production of the country continues to increase as it has done lately, and seems likely to do in the future, the question of the duration of our coal supplies will assuredly come to the front again; but, although the end may come sooner than generally expected, it may be a comfort to know that if even the most pessimistic view be taken it can not come in our time. There are, however, many difficulties to encounter in dealing with the matter, for it is only since 1854 that any trustworthy records of the output have been kept, since which time the question of the duration of our coal supply has been constantly cropping up. As early as 1863 Sir William Armstrong, in his address to the British Association for the Advancement of Science, drew attention to the rapidly increasing output of coal, and assuming an arithmetical increase like the preceding years to continue, the coal to a depth of 4,000 feet would be exhausted in two hundred and twelve years from 1863, but long before that period the scarcity of coal would be felt. Varied were the views taken on the matter, Prof. Hull, who is looked upon as an authority in the matter, giving it as his opinion in 1864 (when the output had reached 90,000,000 tons) that the annual output would never go beyond 100,000,000 tons, an opinion which was falsified only two years later, when the output was considerably in excess of 101,000,000 tons. In 1865 Prof. Jevons caused some alarm by pointing out that the annual increase was geometrical, and basing his calculations on recent returns, he came to the conclusion that our coal supply would be exhausted in one hundred and ten years. The result was the appointment, in 1866, of a royal commission to inquire into the probable duration of our coal supply, and in the report, which was issued in 1871, it was stated that at a depth of 4,000 feet, the probable limit of successful working, there was an available supply of 139,000,000,000 tons of coal, and at the rate of the output then existing, namely, 110,000,000 per year, the supply would be sufficient to last twelve hundred and sixty years. Since that date, however, the output has continued to increase, and seems likely to do so in the future, so that the estimate formed by the royal commission in 1871 will be considerably in excess of the probable duration of our coal fields, despite the greater exercise of economy and the growing use of steel which has characterized the past few years. It is not long since a ton of iron rails required the consumption of 5 tons of coal, but now we are told that a ton of steel rails only costs about half that quantity of fuel, to say nothing of the increased wear of the latter.

From the following table it will be seen that most of the districts show an increase, though by no means uniform, whilst the only districts showing a decline are North Staffordshire, Cheshire, and Shropshire, the falling off being 34,641 tons:

Districts.	1887.	1888.
	Tons.	*Tons.*
Northumberland, North Durham, and Cumberland	15,310,026	17,915,571
South Durham and Westmoreland	21,008,876	21,501,886
North and East Lancashire and Ireland	9,893,631	10,173,161
West Lancashire and North Wales	13,693,321	13,835,867
Yorkshire	20,104,713	20,576,375
Notts, Derbyshire, Leicestershire, and Warwickshire	17,214,907	18,095,240
North Staffordshire, Cheshire, and Shropshire	6,183,200	6,148,559
South Staffordshire and Worcestershire	9,019,106	9,773,788
South Wales, Gloucester, and Somersetshire	28,007,056	29,595,668
East Scotland	15,268,186	15,815,372
West Scotland	6,216,790	6,503,732
Total	162,119,812	169,935,219

The marked increase in Northumberland, North Durham and Cumberl and is due to the disastrous strike which took place in 1887, whilst that of South Wales is no doubt due to the better demand for steam coal, which made its appearance in that

district during last year and may be said to be making itself felt in most of the other districts. The most uniform progress, compared with several years ago, appears to have been made in Yorkshire, Derbyshire, Notts, South Wales, and Scotland, which, with the exception of the last named, are the principal districts with the best supplies for future requirements. The coal fields of Northumberland, Durham, and Staffordshire, the oldest in the country, have made but little progress lately, but these districts are not by any means worked out, and with better prices ruling the coal hitherto unworked on account of mining difficulties will probably soon be opened. It is doubtful, however, whether these districts so long worked will be able to keep up with the newer districts, where unusual mining difficulties are not likely to be met with for some years to come.

So far as regards the evolution of force, the enormous comparative waste of the products of combustion which accompanies even the most advanced methods of utilizing fuel known at the present day would seem to afford a margin to the efforts of scientific investigation which it can scarcely fail, in course of time, to enter upon and make available.

If the small proportionate quantity of the total heat energy resident in coal, which it is now considered possible to control (say 20 or 25 per cent), could be multiplied even by 2 or 3 there would still remain a surplus for waste, but the same work would consume only one-half or one-third of the coal, which would, of course, be tantamount to multiplying as many times the available reserves now known to exist.

If, coincidently, a corresponding increase could be accomplished in the economy of application, whereby a given force should be made to do effective work beyond the present limit, in such event the question of supply would come to wear a much less ominous front than is lent to it by figures like those which have been cited.

These proportions are, of course, truisms, but, incidentally to the subject, it may be added that the incidence of this more or less remotely threatened scarcity appears already to be making itself manifest by turning men's thoughts towards auxiliary sources. For example, it has been recently announced that water gas, for whose use great advantages are claimed, can now be manufactured in the Leeds district at a cost of somewhat less than 4*d.* sterling (or about 8 cents Federal currency) per 1,000 feet.

Annexed is a statement derived from a recent advertisement, and giving—

The mechanical process followed in producing water gas consists in charging the generator with fuel and fire, and blowing it up to a bright heat for a few minutes—experience shows that ten minutes is the best period. During this time a gas known as producer gas is generated, which passes away by the outlet to any furnace—boiler or other—where it is desired to burn it. This gas is of about the same chemical composition as ordinary Siemens gas, and may be used for any of the purposes to which that is applied. It has an average of 31 per cent combustible gas, and may, if desired, be stored in a holder and distributed for consumption through regenerators, as is commonly done. At the termination of the blowing period, the wheel M is turned, and through the mechanism L the wind valve O and the exit valve G are closed. The position of the slide valve E is changed, so that the communication

between the generator and the air pipe is closed, and that between the generator and the gas pipe, communicating with the scrubber, is opened, and the steam slide K is opened. These operations are performed in regular sequence and without the possibility of error, and the mechanical construction of the slide valve E is such that should the blast valve O and also the slide valve be not absolutely tight no air can possibly get from the blast side to the gas side by reason of the channels in the valve, which communicate with the air. The channels also permit the residue of air which is in the ports and passages after blowing ceases to escape before the gas comes down, so that no mixture of gas and air can take place, and the same escape of residual gas takes place after gas-making.

The valves being thus set for gas-making, the attendant regulates the quantity of steam by the hand wheel N to the pressure necessary to force the gas into the holder; gas is instantly generated at a great rate. At Leeds forge the make is about 1,500 cubic feet per minute; but the make will depend upon the size of the plant. Gas is made for four minutes, which is found in practice to be the best period, the steam is then shut off and the lever reversed to its former position, thus reversing the position of the valves, and the fuel in the generator, which has been cooled by the passage of the steam, is again blown up for a ten minutes' period; and so the process goes on, alternately blowing hot and making gas or cooling down.

Periodically a hopper or two full of fuel is let into the generator by raising the lid I, leaving the stopper H in position and filling the hopper. The lid is now lowered and the stopper raised, working it up and down by the hand-wheel and chain to assist the fuel to fall. It is best to keep the fuel high in the generator, as a tall column of fuel produces better gas than a short column. At intervals of about six hours it is necessary to clean out the clinker from the bottom of the generator. This is done through the doors PP, and usually occupies about fifteen minutes. The generators may be worked by ordinary laborers after a few days' instruction, and no special skill is necessary in the manipulation of the plant.

The average yield of water-gas from common gasworks coke is 34,000 cubic feet to the ton, and the production of each generator in use at Leeds Forge is 22,000 cubic feet per hour, or 528,000 per day, the cost of gas being under 4*d.* per 1,000, including fuel, water, wages, superintendence, depreciation, and interest. Each cubic foot of water produces 2,250 cubic feet of gas, or one ton of water (which in Leeds costs 5 farthings) will produce over 80,000 cubic feet of gas. The fuel required to produce this amount of gas is 2½ tons, costing say 20*s.*; labor cost 2*s.* 6*d.*; interest and depreciation costs 5*d.* per 1,000 cubic feet, on 86,000 is 3*s.* 4*d.*, allow 5 per cent for contingencies, and the cost of this quantity of gas is about 26*s.* 3*d.*, or about 3*s.* 9*d.* per 1,000 cubic feet. In this estimate the value of the producer gas generated in blowing the fuel hot is not taken into consideration, but it is set off against the amount of fuel which would be required to generate steam for driving the engine and to be used in making gas, and which is not included in the amount of fuel named above.

At the Leeds forge this producer gas is used for firing the four furnaces, of two 30 feet by 7 feet 6 inches Lancashire boilers, fitted with Foxe's patent corrugated furnaces, forming part of a bench of six boilers supplying steam to a portion of the works. Before applying the gas it was difficult, when all the engines, mills, steam-hammers, and presses were at work, to keep steam up to 60-pound pressure, and the consumption of coal for the six months was 6,153 tons. Since applying gas the steam has been evenly maintained without any great exertion, and the consumption of coal during the six months of using gas was 5,258 tons, or a saving of 895 tons.

Applying approximately the figures here set forth and expressing amounts in American money, we shall have, water, 1 ton, 2½ cents; fuel, 2½ tons, $4.87; labor, 61 cents; interest and depreciation, 81 cents; contingencies, say 8½ cents; total, $6.40 for a product of, say 80,000 cubic

feet, or at the rate of 8 cents per 1,000 cubic feet. The statement from which I quote proceeds:

During eight months 752 tons of coke were used in the generators and 35,575,600 cubic feet of gas made. In the production of water-gas three-fourths of the fuel charged into the generator is consumed in blowing the generator hot, and it is the product from this quantity which is burnt under the boilers and the combustion of which has so materially affected the coal consumption at the boilers. It is apparent that the above saving can not be due to the application of gas, but owing to the superior quality of the fuel, coupled with the perfect combustion of the gas as compared with the very imperfect combustion of the coal, it is calculated that 70 per cent of the total saving is due the application of gas to the boiler.

* * * * * * * *

Among the many purposes to which water-gas may be applied are melting and refining of iron, steel, copper, silver, gold, etc.; welding steel and iron; smith's forges—brazing, etc.; melting glass; calcining cement, lime, etc., burning porcelain, china, high-class pottery, tiles, bricks, etc.; driving gas engines; lighting houses, streets, churches, caverns, etc.; for many of which purposes it is in use at Essen, at Hœrde, at Furstenwolde, at Gelnhausen and Warstein in Germany, at Witkowitz in Austria, at Winterthur in Switzerland, at Paris, at Leeds, and in over 300 cities and towns of the United States of America, the last to adopt it being the State of Massachusetts, in which, formerly, laws existed prohibiting its use.

The application of water-gas to industrial purposes is unlimited in extent. Whether the heat required be intense or moderate, the gas is under such perfect control that it may be safely applied to any purpose whatsoever. In iron works, where perhaps the highest temperatures are required, the water-gas has proved itself an invaluable aid to the production of the best qualities of material, and not only so, but it has cheapened the production by providing the means of a vastly increased output on a given capital outlay in plant.

It is these processes and such as these that the manufacturer in coming time will be compelled to undertake in order to counteract or in some sort mitigate the tremendous destructiveness of modern methods. To gas, and to that still further sublimation of the powers of heat called electricity, it would seem probable that production must have recourse for economy in expenditures of the crude force supplied by nature in the oil and coal deposits. That such recourse will have successful issue would not appear doubtful if we may judge from the past history of the race. Through every age and with only temporary interruptions the day's deed has furnished the day's need, and we may confidently trust that such will be the story of the future.

F. H. WIGFALL,
Consul.

UNITED STATES CONSULATE,
Leeds, April 25, 1889.

ENGLAND.

PUBLIC OWNERSHIP OF GAS WORKS IN ENGLAND.

REPORT BY COMMERCIAL AGENT SMYTH, OF HUDDERSFIELD.

The tendency on the part of municipalities in England to control and manage their own gas works is steadily on the increase. The success which attended the first move in this direction has been a strong in-

centive to a number of towns in the provinces to fall in, and, by the purchase of corporate and private works, become the manufacturers and consumers of their own gas. Statistics show that one-half the gas consumers in Great Britain burn gas of their own or municipal manufacture. With London excluded the proportion is two-thirds. In the brief space of six years the number of towns thus operating has increased from 148 to 173. The result has proved highly satisfactory in every town where the experiment has been tried. The twelve largest public gas works in the country, each producing over 600,000,000 cubic feet of gas annually, are shown below:

1888.	Gas receipts.	Gas expenses.
Manchester	£453,122	£347,642
Birmingham	487,576	349,401
Leeds	221,493	178,707
Glasgow	383,566	334,505
Nottingham	188,442	119,573
Bradford	179,413	131,952
Edinburg	195,324	124,887
Leicester	135,930	81,236
Belfast	132,918	91,024
Salford	142,410	84,832
Oldham	106,318	78,244
Bolton	99,487	51,562

It will be seen that, notwithstanding repeated reductions in price and the generally gratuitous supply of public lamps, the municipalities which engage in gas supply easily make a considerable annual profit. This profit not only suffices in nearly all cases to pay the interest and sinking fund of the gas debt, but also furnishes a contribution towards other public services. This contribution might be larger if the price charged to the consumer were not, quite properly, steadily lowered, but the following towns derive a substantial net revenue from their gas undertakings after paying all gas liabilities:

1888.	Net profit.	Minimum price of gas per 1,000 cubic feet.*
		s. d.
Manchester	£50,623	2 8
Birmingham	40,916	2 3
Salford	37,174	2 9
Leicester	26,403	2 4
Bolton	24,562	3 0
Nottingham	24,547	2 2
Belfast	19,542	2 9
Bradford	18,132	2 3
Oldham	13,096	2 7
Birkenhead	10,582	2 9
Huddersfield	9,113	2 9
Carlisle	6,914	2 3

* Where the price varies the lowest charge to the public has been taken. A discount is often given to large consumers. The cost of gas necessarily varies according to the distance from the source of coal.

nancial reform association, an organization of pronounced radi-
ıion, has been pegging away at this and kindred subjects for
Its cheap literature has been a rich source of valuable informa-
he working element of the country, and has been a very poten-
or in the creation of those ideas and sentiments on the subject
cter economy in the administration of public affairs which have
practical application through the medium of the ballot in nearly
e large cities of England. Here is what one of their writers has
n this subject:

ıerally, however, the practice is to supply as much gas as possible at the
ssible price, and no pecuniary profit is aimed at. In Leeds, indeed, this
s carried to the point in 1888 of making a deficit of £5,970 on the amount
to make the accustomed repayment of debt. No other large town failed
make a net profit, but in 11 small undertakings the surplus proved in-
to make the usual repayment of debt; in 7 small places it was insuffi-
meet the interest charge, and only in 5 village undertakings was there an
s. The total deficiency in these 23 less successful undertakings was much
the net profit of Manchester or Salford alone. The aggregate net profit of
ore prosperous undertakings, after paying interest and sinking fund on all
ebt, was no less than £479,489.

dertaking of gas supply by the public authority is by no means confined to
ıicipalities. Among the 173 public gas works are many places of relatively
portance. Such, for instance, as the following Urban Sanitary Author-

1888.	Gas receipts.	Gas expenses.	Price of gas per 1,000.
			s. d.
-Sittingbourne (Kent)	£1,210	£1,018	3 9
folk)	511	431	3 4
Salop)	869	533	5 6
ale (Lancashire)	1,111	749	3 9
rks)	1,144	858	5 0
Durham)	511	352	4 2
y (Glam)	1,279	660	2 9

ıese diminutive undertakings, supplying sometimes as few as 150 consumers,
ıg less than 2,000,000 cubic feet annually, are carried on at a pecuniary
d to the great convenience of the public.

ublic authorities still, however, neglect to assume the control of what is
r a public function, and still allow the monopoly of public lighting to be a
profit to private shareholders. Foremost, as usual, in this neglect of pub-
tands London, paying annually £4,400,00 for gas which costs only £2,900,000
e, and thus yielding a profit of £1,500,000 upon a total capital outlay of
£14,000,000. The evil example of the metropolis has apparently corrupted
ors, there being no public gas works at all in Middlesex, Surrey, or the
of Kent or Essex bordering on London, although this populous area main-
ewer than 48 prosperous companies. Over a third of the gas consumers in
lom who are still supplied by joint-stock gas works dwell in this virtually
itan area.

ing this dark spot, nearly two-thirds of the gas consumers in the provinces
ly supplied from public undertakings, and the proportion is rapidly increas-

ing. Some considerable municipalities still, however, leave their gas supply in private hands, the principal being—

1888.	Gas Company's receipts.	Gas Company's expenses.	Minimum price of gas per 1,000 cubic feet.
			s. d.
Liverpool	£496,460	£381,206	2 8
Dublin	239,834	160,206	3 4
Sheffield	228,523	151,902	1 10
Bristol*	186,800	127,586	2 4
Newcastle*	160,551	103,840	2 1
Brighton	145,495	98,953	3 1
Portsmouth*	90,048	61,578	2 6
Hull	83,385	56,328	3 0
Cardiff	73,218	56,838	2 6
Preston	71,824	48,929	3 2½
Plymouth	63,046	52,716	1 9
Sunderland*	56,474	41,019	2 0

*Water supply also in private hands.

It will be noticed by the above that Dublin pays more for its gas than any of the large English cities mentioned in the first table. Belfast, its great rival, owns its own gas works, and the result is that the people in that city, manufacturing and consuming their own gas, have only to pay 66 cents per 1,000 cubic feet, while the inhabitants of Dublin are compelled to pay 81 cents to swell the enormous profits of the private monopoly which supplies them.

These municipalities still, however, pay a large annual profit to shareholders for the privilege of defraying the actual cost of lighting their own towns. The total capital of the 395 gas companies is £37,750,000, upon which a net profit was made in 1888 of £3,430,000. The market value of the companies' stock may be put approximately at £70,000,000, the interest on which as municipal debt would be only two-thirds of the revenue now paid to the shareholders.

The income tax returns, as shown by the table below, will give an idea of what profits are made in this country from the manufacture and sale of gas. It must be remembered that the amounts represent but 25 per cent of the real value.

Profits of gas companies assessed to income tax from 1868-'69 to 1883-'84, inclusive.

	England.			Scotland.	Ireland.	United Kingdom.
	Metropolis.	Rest of England.	Total.			
1868-'69	(*)	(*)	£1,747,666	£146,698	£76,819	£1,971,183
1869-'70	(*)	(*)	1,904,632	161,729	90,913	2,157,274
1870-'71	(*)	(*)	2,337,185	166,970	101,339	2,605,494
1871-'72	£812,240	£1,576,723	2,388,963	173,632	104,903	2,667,498
1872-'73	837,344	1,654,056	2,491,400	195,164	109,947	2,796,511
1873-'74	795,500	1,612,194	2,407,694	171,796	86,363	2,665,853
1874-'75	831,743	1,554,660	2,386,403	190,129	53,484	2,630,016
1875-'76	1,803,512	1,715,046	2,718,558	214,340	97,294	3,030,192
1876-'77	1,005,074	2,021,609	3,026,683	263,294	143,913	3,433,890
1877-'78	1,225,570	2,225,940	3,481,510	282,555	159,085	3,923,150
1878-'79	1,197,195	2,343,204	3,540,399	261,534	170,702	3,972,635
1879-'80	1,213,005	2,508,976	3,721,981	260,743	192,665	4,175,389
1880-'81	1,384,534	2,640,401	4,024,935	293,469	186,598	4,505,002
1881-'82	1,433,747	2,703,426	4,137,173	313,468	189,722	4,640,363
1882-'83	1,321,762	2,838,982	4,160,744	335,212	190,677	4,686,633
1883-'84	1,392,459	2,923,517	4,315,976	363,471	200,023	4,879,470

* Can not be distinguished.

The writer very truly remarks that the pecuniary profit to be made by converting private gas works into public ownership is of much less importance than obtaining absolute control over this branch of the public service. Where private monopolies prevail the poor generally suffer, as corporations of the gas type have very little contact with them and consequently very little sympathy to extend to them. Thus they are deprived of the comforts of gas for either lighting or cooking. In a country like this, where fogs and damps prevail throughout the winter season, these comforts have a very important significance.

WILLIAM P. SMYTH,
Commercial Agent.

UNITED STATES COMMERCIAL AGENCY,
Huddersfield, October 30, 1891.

BIRMINGHAM DISTRICT.

REPORT BY CONSUL JARRETT.

CITIES AND POPULATION.

In reply to your circular of February 15th last, I have the honor to submit the following report on the principal gas undertakings in this consular district, including Birmingham, Coventry, Smethwick, Tipton, Walsall and West Bromwick, all of which are operated by the local authorities. Also Bilston, Leamington, Lichfield, Warwick and Wolverhampton, operated by private companies.

Birmingham is a city about 4 miles long, and 3 in breadth. It is situated on the northwest border of Warwickshire, near Staffordshire and Worcestershire, in latitude 52° 29′ north, longitude 1° 48′ west; and is distant 97½ miles southeast from Liverpool, and 112½ miles northwest from London by railway. Its population in 1881 (census year) was 400,757. It is now estimated to be nearly 500,000.

Coventry is in Warwickshire, 21 miles southeast from Birmingham. Population, 47,336.

Smethwick is in Staffordshire, 3½ miles from Birmingham. Population, 25,076.

Tipton is in Staffordshire, 8 miles from Birmingham. Population, 30,013.

Walsall is in Staffordshire, 8 miles from Birmingham. Population, 49,023.

West Bromwick is in Staffordshire, about 5 miles from Birmingham. Population, 56,229.

Bilston is in Staffordshire, 10 miles from Birmingham. Population, 22,730.

Leamington is in Warwickshire, 23½ miles southeast from Birmingham. Population, 25,138.

Lichfield is in Staffordshire, 21 miles northeast from Birmingham. Population, 8,630.

Warwick is in Warwickshire, 21 miles southeast from Birmingham. Population, 11,802.

Wolverhampton is in Staffordshire, 13 miles northwest from Birmingham. Population, 164,303.

GAS STOVES.

All gas undertakings are required by law to report annually a statement of accounts to the board of trade. I take pleasure in forwarding you copies of the last published parliamentary returns of gas undertakings in this country.

The following tables* are taken from the parliamentary returns, No. 1 being the returns of the local authorities referred to in this report, and No. 2 the returns of companies referred to. Replies to questions 2, 3, 5, 6, 7, 8, and 11 of the circular are given in these tables.

Having visited a few of the leading gas works, I find nothing of importance regarding "process of manufacture" to report upon. Gas is produced by resorts in the usual way. A well ordered gas works at home is equal to any I have seen here and superior to some.

The use of gas stoves for cooking prevails to some extent and is increasing year after year. The gas concerns either hire or sell these stoves to consumers. The prices charged by Birmingham are as follows:

	Prices, enameled steel.	Hire, rates per quarter.	Hire, purchase in two quarterly installments.
B. 1400*	$9.12	$0.49	$0.85
B. 407	25.91	.97	2.19
B. 410	31.62	1.09	2.68
B. 415	37.35	1.28	3.16
B. 420	43.19	1.52	3.65
B. 425	48.66	1.70	4.14
B. 440	65.69	.....	5.83

*Cast iron not enameled.

The prices for sale on the three years' system are based on the return to the Birmingham Gas Department in the twelve quarterly installments the retail price of the stove.

The prices for permanent hire are calculated to return the Gas Department the cost of the stove with interest at the rate of 5 per cent per of annum, and with a slight addition to cover the cost of repairs in seven years, by which time it is anticipated the stove will practically have to be renewed.

Birmingham is, however, almost the only concern by which stoves are not let out on hires at much lower rates than these. Wolverhampton, for instance, hire stoves at fully 50 per cent less than Birmingham. A few companies charge less still. Where these low prices are adopted it

*Introductory tables immediately under the head of "The United Kingdom."

is necessary to set aside annually out of the receipts for gas a sum of money to provide for the loss on the stoves, thus giving in effect virtually a preferential rate for gas used for cooking purposes.

I have had much difficulty in procuring such information as I have desired from the various gas undertakings; especially has this been the case with private companies.

WAGES.

The wages of employés and the hours of labor vary at the different works in accordance with the method of carbonization, size of retorts, etc,

The wages paid at the largest and most modern works at Birmingham are as follows:

General foreman.....per week..	$17.03	Engine-fitters.....per hour..	$0.14
Subforeman and timekeeper, per week	8.51	Strikers .....do....	.10
Siphon pumpers.....per week..	5.83	Tinmen ....do....	.14
Gas-fitters .....per day..	1.46	Carbonizers:	
Rough fitters .....do....	1.22	Stokers and firemen, per shift.	1.26
Pipe-layers, etc .....do....	1.22	Coke-wheelers ....per shift..	1.09
Laborers ..... do....	.91	Puller-up .....do....	.85
Cold-retort pointers.....do....	.85	Pipe-jumpers, hot-retort menders, and scurfers, per shift	1.03
Locomotive drivers .....do....	1.09	Coal-wheelers.....per shift..	1.09
Firemen and shunters.....do....	.97	Laborers and coal-trimmers, per shift	.85
Plate-layers.....do....	1.22	Machinemen employed with stoking machinery, per shift	.40
Gas-engine attendants ....do....	1.05		
Carpenters.....per hour..	.15		
Bricklayers .....do....	.16		
Blacksmiths .....do....	.14		

All workmen engaged in the actual work of carbonization are employed in eight-hour shifts. Other workmen are employed for nine hours per day.

The wages paid by the various local authorities' gas undertakings are nearly the same as those given for Birmingham.

I have not been so successful in getting a complete list of wages paid at any of the private company undertakings. I submit the only few particulars I have received, as follows:

Wolverhampton reports wages paid each man per week of fifty-six hours from $8.51 to $10.34.

Leamington reports the following rates: Foreman stokers, $1.28 per day of twelve hours; first-class stokers, $1.15; second-class stokers, $1.09; mechanics, from 9½ cents to 15 cents per hour; yard laborers, from 8½ cents to 10 cents.

Warwick: Stokers, $1.09 to 97 cents per day of twelve hours; laborers, 73 cents.

Lichfield: Foreman stokers, $8.51 per week of fifty-six hours; ordinary stokers, $7.29 to $6.81; laborers, 85 cents per day of twelve hours.

Bilston: Stokers, $1.22 to $1.34 per day; laborers, 81 cents per day.

I take pleasure in forwarding to the Department copies of the various statements of accounts I have received, also of Parliamentary returns published for present session of Parliament. Also a report on gas undertaking from consular agent at Kidderminster.

JOHN JARRETT,
UNITED STATES CONSULATE, *Consul.*
Birmingham, May 29, 1890.

BRADFORD DISTRICT.

REPORT OF CONSUL TIBBITS.

This report has been delayed until this time in the hope that responses might be received from all the companies and corporation authorities to whom letters of inquiry have been addressed. Fourteen of the thirty-seven gas companies and corporation gas works in this district have, however, failed to furnish any information although respectfully requested to do so. As to these fourteen companies I have collected from the latest official returns made to the House of Commons such information as was to be found therein bearing upon the several topics of inquiry suggested in the Department's circular.

These official returns cover, for gas works belonging to local authorities, the year ended March 25, 1889, and for other gas works the year ended December 31, 1888. It may be safely assumed that the statistics gathered above referred to in nearly every instance represent substantially the present status of the several works.

It has been impossible to report in all cases as to population, inasmuch as some of the gas companies supply only certain districts of the towns in which they are located.

Very few companies have reported as to the extent to which gas stoves are used. From the best information obtainable I am satisfied that the use of these stoves, except in Bradford and a few of the larger towns of the district, is very limited. The number used for heating is largely in excess of that used for cooking.

For convenience of reference, the report has been prepared in tabulated form. The statistics as to companies and corporations from which direct returns have been received are included in Exhibit A; those as to companies and corporations not making direct returns, in Exhibit B.

With reference to the Bradford corporation gas works, it is to be noted that the statement of capital invested to December 31, 1889, viz, £576,690 2*s.* 3*d.*, does not represent the amount actually expended.

The works were, by virtue of an act of Parliament, acquired, by the corporation from a private company in 1871 for £210,000. This company being by law limited to the payment of 10 per cent. per annum as

dividends to stockholders had accumulated a large surplus, of which, under the act of incorporation, consumers should have received the benefit in the shape of reduced prices.

The company, however, in violation of the provisions of its charter, expended this surplus from time to time in extending the works, and being unwilling to face a threatened parliamentary inquiry, when the question of a sale to the Bradford corporation was under consideration, accepted the sum above named as purchase money for a plant which could not have been of less value than £400,000.

JOHN A. TIBBITS,
Consul.

UNITED STATES CONSULATE,
Bradford, July 9, 1890.

A.—*Statistics of companies mal*

Name and location of cities using gas.	Population, 1881 census.	Name of gas company.	Capital invested.	Process of manufacture.	Candle power of gas.	Approximate annual output
Yorkshire.						*Cubic f*
Clayton	.....	Clayton, Allerton and Thornton Gas Co.	£59,445	Distillation of coal.	16.80	55,311,(
Brighouse	7,965	Brighouse Local Board	16,000	Usual method.	18.50	66,000,(
Colne	.....	Colne Vale Gas Co	20,000	Ordinary clay retorts.	17.50	40,000,(
Cleckheaton	1,642	Cleckheaton Local Board Gas Depmt.	52,000	Distillation of coal.	17.50	60,000,(
Pudsey	10,063	Pudsey Gas Co	72,880	Ordinary hand labor.	17.60	80,674,(
Holmfirth	5,763	Holmfirth Gaslight Co	16,000	6 hours' charges in settings of 6 retorts.	17	18,000,(
Sowerby Bridge	6,360	Local Board of Health, Sowerby B.	62,000	Coal and cannel.	18.50	98,000,(
Heckmondwike	9,282	Heckmondwike Gas Co	(*b*)	Ordinary process.	16	74,000,(
Eccleshill	.....	Eccleshill and Bolton Gas Co.	18,000	Distillation of coal.	16	19,000,(
Keighley	30,390	Keighley Corporation Gas Works.	116,000	Coal gas	18	200,000,(
Mirfield	15,872	Mirfield Gas Co	48,000	Clay retorts	17	60,000,(
Bingley	20,703	Bingley Improvement Commissioners.	49,854	Ammonium and lime sulphide, caustic lime, and ferric oxide.	16.50 to 17.50	61,532,(
Settle	2,213	Settle Gas Co. Limited	4,520	Ordinary retort process.	19	4,000,(
Batley	32,000	Batley Corporation Gas Works.	.....	Carbonization of coal.	17.94	135,981,(
North Bierley	.....	North Bierley Gas Co	52,211	....do	16	69,000,(
Ilkley	4,736	Ilkley Gas Co	21,600	Usual, coal	17.50	31,000,(
Airedale	.....	Airedale Gas Co	(*f*)	Clay retorts	15	25,000,(
Skipton	9,091	Skipton Gaslight and Coke Co.	18,500	....do	19	42,000,(
Honley	5,075	Honley Gas Co. Limited	10,275	Carbonization of coal.	18.50 to 19	.....
Bradford	229,721	Bradford Corporation	576,690	Hand labor	18.50	1,420,634
Westmoreland.						
Kendal	.....	Kendal Union Gas and Water Co.	£37,600	Distillation of coal.	19	37,873,(
Lancashire.						
Burnley	32,000	Burnley Corporation Gas Works.	185,000	Carbonization of coal.	18.50	352,280,(
Clitheroe	10,177	Clitheroe Corporation	38,972	Ordinary process.	19	24,000,(

a 2*s.* 9½*d.*, less 2½ to 10 per cent. *b* £39,300 paid up; £3,000 on loan.
c When under 80,000 cubic feet per half year, 3*s.* 2*d*; over 80,000 cubic feet, 2*s.* 10*d.*; and for pu lamps, market, etc,, 2*s.* 6*d.*, net.
d With discount. *e* About 400 public lamps. *f* Discounts, 15 to 2 per cent.
g 3*s.* 5*d.*, less 5*d.* per 1,000 cubic feet; Batley lamps, 1*s.* 6*d.* net; outside borough, 3*s.* 8*d.*, less per 1,000 cubic feet.

direct returns to Consul Tibbets.

Number of consumers.	Price of gas per 1,000 cubic feet.	Use of gas stoves for heating and cooking.	Wages of employés and hours of labor.	Material used in the manufacture of gas, where obtained, and price at the gas works.
	s. d. *s. d.*			
2,813	2 11 to 2 7½	.....	Stokers, 36*s.* 3*d.* per week, 7 days, of 12 hours; laborers, 22*s.*; main and switch layers and meter repairers, 30*s.* per week, 6 days; meter inspectors 24*s.* per week.	West Yorkshire coal with 12½ per cent of cannel; average price last year about 12*s.* 6*d.* per ton.
2,500	2 0	.....	Stokers, 5*s.* per day, 12 hours; laborers, 3*s.* 6*d.* per day, 9 hours; fitters, 4*s.* per day, 9 hours; inspectors, 5*s.* per day, 9 hours.	Coal and cannel, 10*s.* per ton.
450	3 3	.....	2½*d.* per 1,000 in the gas house; 5*d.* per hour in yard, all 10-hour shifts.	Pea coals used, from Liversedge, 7*s.* 9*d.* per ton.
.....	2 8½	.....	Stokers, 5*s.* per 8 hours; laborers, 3*s.* 6*d.* per 8 hours.	Local coal, 9*s.* per ton.
4,500	(*a*)	.....	Stokers, 35*s.* per week, 12-hour shifts; laborers, 20*s.* per week, 56 hours.	Coal from Barnsley, Lofthouse, Howdenclough, and Roundwood, 9*s.* per ton.
800	3 4	.....	Stokers, 12*s.*, hour shifts, 4*s.* 6*d.* per shift; yardmen and fitters, 4*s.* 10*d.* to 3*s.* 4*d.* per day of 9 hours.	New Hards, Flockton, Silkstone, and Barnsley, price 10*s.* 8*d.* per ton.
4,500	2 3	.....	Stokers, 5*s.*, laborers, 4*s.* per day, 56 hours per week.	New Hards, Flockton. 10*s.* 7*d.*, and cannel coal from Wigan, at 18*s.* 10*d.* per ton.
3,082	(*c*)	.....	Foremen stokers, 38*s.* per week, 54 hours; ordinary stokers, 3*s.* 4*d.* per week, 54 hours; yardmen, 22*s.* per week, 51 hours.	Coal, from immediate neighborhood, 8*s.* per ton; lime, from Buxton, for purifying, at 15*s.* 3*d.* per ton.
1,000	3 1	.....	Stokers, 32*s.* per week, 8 hours per day; yardmen, etc., 24*s.* per week, 12 hours per day.	Coal from Mirfield, 10*s.* per ton.
9,000	2 3 to 2 6	.....	Stokers, 5*s.* per shift, of 8 hours; wheelers, 4*s* per shift, of 8 hours. Furnacemen, 5*s.* per shift, of 12 hours.	Coal from Barnsley and West Yorkshire, 12*s.* per ton.
2,500	*d*3 3	.....	Stokers, 4*s.* 6*d.*; yardmen, 3*s.* 6*d.* per day, 12 and 9 hours shifts.	Common coal from district.
*e*3,378	*f*3 6	.....		
220	4 7	.....	Total amount of wages, £82 10*s.*	Coal from near Leeds, at 12*s.* 5*d.* per ton, and cannel coal from Wigan, at 26*s.* 2*d.* per ton.
.....	(*g*)	.....	Stokers, 5*s.* per shift, of 8 hours; laborers, 21*s.* per week, of 52 hours; average for artisans, 30*s.* weekly, 52 hours per week.	Coals, from neighborhood, good quality.
4,500	2 3 to 3 1	(*o*)	5*s.* for 12 hours	Coal, from Wakefield and Sheffield.
765	3 0	.....	.....	Coal from West Riding.
1,327	(*k*)	.....	Stokers, 33*s.* per week, 12 hours per day; other employés vary.	Lofthouse, Mirfield, etc., about 10*s.* 4*d.* per ton.
1,900	*l*2 8½	.....	28*s.* per week; some 8 hours and some 12 hours per day.	Coal and cannel, 12*s.* 9*d.* per ton.
800	*m*3 9	.....	30*s.* per week, 84 hours	Coal, 75 per cent from Ravensthorp, at 9*s.* 6*d.* per ton, and cannel coal, from Batley, at 16*s.* 9*d.* per ton.
49,500	*n*2 3	5,035	Stokers, 5*s.* per shift, of 8 hours; laborers, 5*s.* to 3*s.* 10*d.* per day.	Coal, four-fifths, and cannel, one-fifth, from 12*s.* 6*d.* to 17*s.* per ton.
1,238	(*i*)	.....	Stokers, 30*s.* 4*d.*, 73½ hours per week; yardmen, 20*s.*, 53½ hours per week.	Coal from Wigan, 10*s.* 6*d.*; and cannel nuts, from Wigan, 16*s.* per ton.
12,600	2 3	.....	Laborers, 4½*d.* to 5*d.* per hour; gasfitters, 7½*d.* per hour; other trades, from 6 to 8½*d.* per hour. 49½ hours per week; stoker's average wages, 5*s.* 6*d.* for 8 hours' shift.	Coal, from local pits, at 9*s.* 9*d.* per ton, and cannel, from Wigan, at 13*s.* 9*d.* per ton.
1,200	3 6 to 3 0	1.30	Stokers, 28*s.* to 35*s.* per week, laborers, 27*s.* to 21*s.* per week.	Coal from Burnley, at 14*s.* per ton.

h Gas and water.
i 3*s.* 6*d.*, with discounts; 3*s.* 4*d.* for gas engines, cooking, etc., 2*s.* 10*d.* for public lamps, net.
j £21,000 stock; £2,950 mortgages.
k 3*s.* 9*d*, reduced to 3*s.* 1*d.*, 2*s.* 11*d.*, and 2*s.* 10*d.*, according to consumption.
l Discounts, 2½ to 12½ per cent.
m Discounts, 2½ to 7½ per cent; public lamps, 15 per cent.
n Discounts, 2½ 12½ per cent.
o Very small.

B.—*Statistics from parliamentary returns of the companies refusing direct returns to Consul Tibbits.*

Name and location of cities using gas.	Population (1881 census.)	Name of gas company.	Capital invested.	Candle power of gas.	Approximate annual output.	No. of consumers.	Price of gas per 1,000 cubic feet.
Yorkshire.					*Cubic feet.*		
Birstal	4,426	Birstal Local Board	£41,500	18½	19,351,600	938	4s.6d.; discount 1s.3d.
Dewsbury	29,637	Dewsbury Corporation.	226,283	18.68	174,342,500	6,677	3s.; discount 2½ to 5 per cent.
Halifax	42,635	Halifax Corporation	250,000	17.43	561,919,000	19,200	1s. 11d.; discount 8½ to 12½ per cent.
Haworth	6,873	Haworth Local Board	18,169	17	17,211,100	1,500	3s.3d.; discount 5 to 30 per cent.
Drighlington		Drighlington & Gildersome Gaslight Co.	39,321	17½	30,951,600	1,600	2s.6d.; discount 2½ to 15 per cent.
Elland	13,007	Elland-cum-Greetland Gas Co.	50,014	17½	64,298,000	3,300	2s. 8½d.; discount 2½ to 15 per cent.
Gomersal	13,453	Gomersal Gas Co	17,620	18¾	13,009,200	720	4s.2d.; discount 11d. to 1s.11d.
Hebden Bridge.	5,007	Hebden Bridge Gas Co.	30,074	17	39,331,005	2,050	3s.4d.; discount 10 per cent on accounts of £5 and over per quarter.
Kildwick		Kildwick Parish Gas Co.	37,006	18	24,214,000	1,150	3s.9d.; discount up to 15 per cent.
Kirkburton	5,407	Kirkburton Gas Co	6,400	18 to 20	8,006,000	500	3s.4d. to 4s.2d.; discount 5 per cent.
Ossett	1,095	Ossett Gas Co	37,000	14	57,561,000	2,110	2s.6d.; discount 5 to 10 per cent.
Shipley	20,000	Shipley Gas Co	83,867	18	122,620,000	4,750	3s.4d.; discount 10 per cent.
Todmorden	24,908	Todmorden Gas Co	39,030	18.4	47,440,000	2,940	5s.; discount 3.6 and 12 per cent according to consumption and 10d. additional if paid within 28 days.
Yeadon		Yeadon & Guiseley Gaslight & Coke Co.	36,490	16	49,681,000	1,910	3s. 6½d.; discount 10d.

KIDDERMINSTER.

REPORT OF CONSULAR AGENT MORTON.

ILLUMINATING GAS.

The name of the local gas company, which is incorporated by act of parliament, is the Kidderminster Gaslight and Coke Company, Limited.

The population of the municipal borough of Kidderminster at the last census was 24,270. The company, however, supply gas beyond the municipal limits.

The authorized capital of the company is £36,000, with £3,000 as a reserve fund.

The gas is produced from coal by means of retorts in the usual way. The statutory power of the gas supplied is 16 candles.

The approximate annual output is 108,000,000 cubic feet.

The consumers (meters) number 2,500.

The price of gas to consumers using less than 50,000 feet per quarter is 2*s*. 7*d*. per 1,000 feet; above that quantity 2*s*. 5*d*. per 1,000 feet.

GAS STOVES.

The company have about 600 gas cooking stoves let out on hire. Gas heating stoves are not hired, but it is estimated that 200 are in use, which are the property of the consumers.

WAGES.

The wages paid by the company are as follows: Stokers 4*s*. 8½*d*. per shift of twelve hours, out of which they are seven to eight hours actually at work; general laborers, 3*s*. 1*d*. per day; fitters, blacksmiths, bricklayers, from 5*s*. to 4*s*. per day. The salaries paid to managers and clerks I have not been able to ascertain.

COST OF COAL.

The coal used is ordinary gas coal and about 5 per cent of cannel coal, obtained chiefly from South Yorkshire, Barnsley district; present prices coal, 16*s*. per ton. Cannel, 25*s*. per ton.

MICELLANEOUS.

I may say that although the authorized capital of the company is only £36,000, and the dividends to be paid on the shares are not allowed by their act to exceed the amounts stated on the balance sheets, viz, on original shares 10 per cent, on additonal or new shares 7 per cent, on preference stock 5 per cent, and that the prices of gas must be lowered in case the profits show an excess over these amounts, there is little doubt that large sums have from time to time been expended out of profits on capital account, and, indeed, when several years since the question of the purchase of the concern by the corporation was mooted a sum of £90,000 was talked about as the price the company would ask.

JAMES MORTON,
Consular Agent.

UNITED STATES CONSULAR AGENCY,
Kidderminster, April 12, 1890.

MANCHESTER DISTRICT.

1. Rochdale.
2. Manchester.
3. Salford.
4. Oldham.
5. Bolton.
6. Preston.
7. Bury.
8. Stockport.

REPORT BY CONSUL GRINNELL.

EXPLANATORY REMARKS.

I have the honor to subjoin replies to the gas circular from the heads of the gas departments in the more important towns of this district, viz: Rochdale, Manchester, Salford, Oldham, Bolton, Preston, Bury, and Stockport.

These reports, which have been prepared with great care and accuracy, will, I think, be found to comprise all the information upon the subject desired by the Department; and while they are all complete and thorough, I should, perhaps, call special attention to the more extended report from Rochdale, together with the detailed statistics annexed thereto. These show the exact financial condition of a large corporation, which may safely be taken as typical of similar companies in this portion of England.

I desire to express my warmest thanks to the several municipal governments for the excellence of these reports, and for the prompt and kindly manner in which they were prepared.

ROCHDALE.

Rochdale, in the county of Lancaster, is situated 11 miles north by east from Manchester, and had a population in 1881, when the last census was taken, of 86,865.

For the following interesting and exhaustive replies to my queries I am indebted to Mr. F. Banbury Ball, the engineer and manager of the Rochdale corporation gas works. Mr. Ball also kindly furnished me with a "statistical report" showing the working of the Rochdale gas works from 1886 to 1890, which I inclose herewith.

Amount of money invested, $1,060,282.64. Part of this has been repaid, leaving the present debt $802,760.62. Considerable sums have also been spent on capital account out of revenue, as the corporation decided some years ago that the capital account was unduly heavy, and since 1880 nearly all extensions have been paid for out of revenue.

Process of manufacture.—The process of manufacture is the same as obtains generally in most of the gas works in this country, as at present coal gas—as distinguished from water gas—is exclusively produced. All carbonizing operations are performed by hand. Hydraulic machinery was tried some twelve or thirteen years ago, but failed, partly from inherent defects and partly from the unsuitability of the retort houses. Four-hour charges are adopted instead of the six-hour charges more generally employed, as the standard of illuminating power is rather high (18 candles) and soft coal alone is used. Large yields per ton of coal carbonized can not therefore be expected. The value in pounds of sperm of 9,000 cubic feet of 18 candle gas and 10,000 cubic feet of 17½ candle gas being nearly equal, it is more economical to produce the smaller quantity and do without cannel or more costly high-class coals,

than to leave the coal longer in the retorts, obtaining a greater bulk of inferior quality, and using cannel to bring up the illuminating power to the prescribed standard.

Candle-power of gas.—Eighteen candles supplied, but 16 candles is the standard fixed by the act of Parliament.

Approximate annual output.—353,072,000 cubic feet for the year ending March 25, 1890.

Number of consumers.—There are 20,693 meters in use, and the whole of these are the property of the owner or occupier of the premises supplied. Particular attention is directed to these figures, as for the quantity of gas produced they are probably in excess of any other place in the country. It arises from the fact that it is customary when building houses, however small, to fit them up with pipes, meter, burners, etc., so that the great bulk of the population are consumers of gas. This is strikingly shown by the number of small meters in use compared with the larger sizes. Out of 20,693, the total number of meters in use within the area of supply, 16,513 are 2-light meters. As few restrictions as possible are put in the way of the consumers, asking for no security or deposit except in isolated cases in bad neighborhoods and amongst a migratory population. I must say, however, that it is not altogether without disadvantages, as this plan limits to some extent the control over and the proper inspection of the meters.

Price of gas per 1,000 cubic feet.—Within the municipal boundary the price of gas is 70 cents per 1,000 cubic feet. If the quarter's account is paid within two months of the time it becomes due the following scale of discounts is allowed, viz: To consumers of less than 10,000 cubic feet per quarter, 4 cents per 1,000 cubic feet; to consumers of 10,000 and under 50,000 cubic feet per quarter, 6 cents; to consumers of 50,000 and under 100,000 cubic feet per quarter, 8 cents; to consumers of 100,000 and upwards per quarter, 10 cents.

Gas consumed for cooking, heating, motive power, or purposes other than lighting, is charged 48 cents net per 1,000 cubic feet, but this applies to the municipal area only.

Outside the municipal boundary the initial price is 87 cents per 1,000 cubic feet, with the following scale of discounts on payment within the limit of time above mentioned: 2 cents per 1,000 cubic feet to consumers of less than 10,000 cubic feet per quarter; 4 cents per 1,000 cubic feet to consumers of 10,000 and under 50,000 cubic feet; 6 cents per 1,000 cubic feet to consumers of 50,000 cubic feet and upwards.

Gas stoves.—Gas cooking stoves are let out on hire by this corporation at a rental of 10 per cent on the net cost, and when gas is supplied to them by a separate meter (which can also be hired at a similar rate) the gas is charged 48 cents per 1,000 cubic feet net as before stated. About 500 cooking stoves have been let out, and the system is extending. In consequence, however, of the small size of the meters and fittings in the majority of the premises supplied, the number of cooking and heat-

ing appliances will always remain a small proportion of the total number of meters in use. The corporation do not let out heating stoves on hire on account of the excessive wear and tear on this kind of apparatus and the limited time during which they remain in use. The service pipes are, however, supplied to the premises free of charge if the distance from the main does not exceed 50 yards, but all internal fitting work is done by tradesmen.

Wages.—Stokers are paid $1.21 per eight hours, during which time they carbonize 42 hundred weight of coal, bringing it to the retorts and wheeling away the coke, besides attending to the necessary fires. Enginemen or steam tenters are paid 97 cents per eight hours, and attend to two boilers, the engines, and exhausters, pumps, etc. In both cases Sunday labor is paid for at the rate of time and a half, Christmas day and Good Friday as double time, and one week's holiday in the year is allowed and paid for at the rate of $5.83. Laborers are paid $4.86 per week of fifty-four hours, time-and-a-half being paid for any labor required on Sundays; but holidays are not granted to this class of employés, though they are paid for Christmas Day and Good Friday when they do not work.

Material used.—Bituminous coal has been used exclusively for the past five or six years—chiefly the Arley Mine coal from the Wigan Coal field, this being the nearest source of supply for good gas coal. Previously the Silkstone and other seams from South Yorkshire as well as Black Bed coal from West Yorkshire were used, but the railway rates from the latter sources are heavier and exclude all but the better class coals. For the past two years the average cost of coal delivered at the gas works has been $2.38 per ton, but as this contract was made when coals were at the lowest price it will not be much guide at present, the price now being 60 to 73 cents per ton more than this. It should be stated, however, that the gas works are a mile from either railway or canal, and that all coal has to be carted that distance at a cost of 18 cents per ton.

The gas works have been the property of the municipality about forty-five years and the surplus profits handed over in aid of the rates during that period have been about $1,192,292.50, and for some years past the public lighting has been done free of expense, as will be seen on reference to the accompanying "Statistical Abstract of Accounts" for the past six years.

MANCHESTER.

Manchester, the great center of the cotton industry, is situated in the county of Lancaster. It had a population, when the census of 1881 was taken, of 393,676.

The following replies to my queries were elicited from Mr. C. Nickson, the superintendent of the Manchester corporation gas department. Mr. Nickson also furnished me with a copy of the last published report of this department, "Abstract of accounts for the year ending March *31, 1889,*" which I inclose.

Amount of money invested in the industry, $3,576,103.72.

Process of manufacture.—The stoking is done partly by hand and partly by West and Woodward's drawing and charging machinery.

Candle-power of gas, 20.14 candles.

Approximate annual output, 3,108,269,000 cubic feet.

Number of consumers, about 78,000.

Price of gas.—Sixty cents per 1,000 cubic feet within the city boundary; 73 cents per 1,000 cubic feet beyond the city boundary; 85 cents per 1,000 cubic feet in a few outlying districts. An allowance of 6 cents per 1,000 cubic feet is made to consumers (beyond the city boundary only) of 1,125,000 cubic feet per annum and upward.

Gas stoves.—Gas cooking and heating stoves are supplied by the gas committee for cash at a discount of 20 per cent off list prices on articles of the value of $14.59 and upward, or on easy terms of deferred payment, with a discount of 10 per cent on purchases of the value of $14.59 and upward. Heating stoves are let out on hire at from 12 to 73 cents per quarter; cooking stoves from 36 cents to $1.15 per quarter, and gas washers from 48 to 85 cents per quarter.

The abstract of accounts of the Manchester corporation gas works for the year ended 31st March, 1889, states that the number of gas stoves and other heating appliances out on hire is 1,760, the quantity of gas consumed in their use is estimated to be about 16,250,000 cubic feet, and the revenue derived therefrom is about $12,166 per annum.

Wages.—Stokers, $1.21 per day of eight hours; laborers, $5.35 per week of fifty-four and one-half hours.

Material used.—Cannels and coals from the districts of Lancashire, Yorkshire, Nottinghamshire, and Derbyshire. Average price, $2.85 per ton.

SALFORD.

Salford, in the county of Lancaster, although having a separate municipal government, is only divided from Manchester by a small irregular stream called the Irwell, and is practically a part of the city of Manchester. It had a population in 1881 of 176,233.

Mr. S. Yarrell Shoubridge, the engineer and manager of the Salford corporation gas department, replied to my interrogatories as follows:

Amount of money invested.—Lands, $116,528.34; buildings, $1,555,430.73; new main and service pipes, $811,999.85; new meters, $187,170.45; total amount invested, $2,671,129.37.

Process of manufacture.—The carbonizing is performed in through D-shaped retorts, 22 by 16 inches in section, 20 feet long, heated by regenerative furnaces. The charging and drawing is done by Foulis's hydraulic stoking machinery. In the older retort houses the charging and drawing is done by hand. The purifying is effected by lime and oxide of iron. The revivification of the latter in situ is promoted by the use of the Hawkins arrangement for pumping a small proportion

of carbureted air through the purifiers. The ammoniacal liquor produced is made into sulphate of ammonia, but the tar is sold to distillers.

Candle power.—Actual average illuminating power, 18.78 sperm candles. Standard, according to act of Parliament, 18 sperm candles.

Approximate annual output: 857,770,000 cubic feet.

Number of consumers: Private consumers, 27,387; public lamps, 7,061; total, 34,448.

Price of gas.—The net price of gas, according to quantity consumed, is 58 and 60 cents per 1,000 cubic feet within the borough, and from 68 to 75 cents per 1,000 cubic feet beyond the borough.

Gas stoves.—Gas stoves are let out on the simple hire system, and on the three years' hire purchase system. They also sell gas stoves and gas fires for cooking and heating.

Wages and hours of labor.—Stokers, $1.21 per shift of eight hours; boilermen, 97 cents per shift of eight hours; yardsmen and laborers, $5.35 per week of fifty-four and one-half hours; joiners, $7.78; carters, $5.59; blacksmiths, $8.26 and $7.29; blacksmiths' strikers, $5.84; mechanics, $6.81 to $7.78; bricklayers, 17 cents per hour; chargers, $1.33 per shift of eight hours; drawers, $1.27; coal-breakers, 85 cents; coal-heavers, 85 cents; coke-tippers, $1.09; main and service pipe layers, $5.10 to $7.29 per week of fifty-four and one-half hours; meter-fixers, $4.38 to $8.99.

Material used.—The material used is cannel and common coal in the proportion of 18 per cent cannel and 82 per cent coal, and is obtained from the Lancashire and Derbyshire collieries as follows: Coal—I. and G. Wells, limited; Sydney Kershaw; A. Knowles & Sons, limited; Newton Chambers & Co., limited; Wigan Coal and Iron Company, limited; and Pearson & Knowles Coal and Iron Company, limited. The prices range from $2.43 to $2.71 per ton at the works. Cannel—Sheepbridge Coal and Iron Company, limited; F. H. Eaude & Son; The Whitecross Company, limited; James Smith; Staveley Coal and Iron Company, limited; and Hucknall Colliery Company, limited. The prices range from $3 to $4.74 per ton at the works.

OLDHAM.

Oldham, an important town in the county of Lancaster, is largely given over to the manufacture of cotton goods. Coal-mining is also a prominent branch of industry here. The population of Oldham, when the census of 1881 was taken, was 111,343.

Mr. John Chadwick, the manager of the Oldham corporation gas works, kindly furnished me with the "abstract of accounts and statistical tables" of his department for the year ending March 25, 1[illegible] which I inclose.

Following are the replies of Mr. Chadwick to my interrogatories

Amount of money invested, $2,184,693.51.

Process of manufacture.—Ordinary methods; stoking by hand labor; ordinary furnaces.

Candle power of gas: Average, 20.07.

Approximate annual output, 870,000,000 cubic feet.

Number of consumers, about 42,000.

Price of gas, 54 to 60 cents per 1,000 cubic feet.

Gas stoves.—Not a great number; have not pushed this business.

Wages.—Laborers, $5.41 per week of fifty and one-half hours; stokers, $1.21 per shift of eight hours. Sunday work reckoned as time and a half.

Material used.—Cannel about 11 per cent; coal about 89 per cent. Cannel is obtained from the Wigan district in Lancashire. Coal is obtained from Wigan and Oldham in Lancashire and from Yorkshire. The average price for cannel last year was about $5.59 per ton and for coal about $2.67 per ton. These prices will probably be advanced for current year's contracts.

BOLTON.

Bolton, in the county of Lancaster, had a population at the last census of 105,414.

The town is lighted with gas by the corporation, who succeeded a private company (incorporated in 1818) in the possesssion of the gas works, which the corporation have greatly enlarged and improved, and are still extending.

Mr. William Smith, the engineer and manager of the Bolton corporation gas department, gave me the following information:

Amount of money invested, $2,484,158.45.

Process of manufacture.—Ordinary system; retort setting of 7°. No regenerators.

Candle power, 18.25.

Approximate annual output, 644,273,000 cubic feet of gas sold.

Number of consumers, 27,607 meters in use.

Price of gas.—Sixty-four cents per 1,000 cubic feet net within a radius of 2 miles; 77 cents net outside the 2-mile radius.

Gas stoves.—Forty gas stoves and 480 cookers have been sold or let out on hire.

Wages.—Stokers are paid $1.21 per shift of eight hours, charging and drawing 2 tons each. Sunday work is paid for at the rate of time and a half. Laborers receive $5.35 per week of fifty-four and one-half hours. Overtime is paid for as time and a quarter.

Material used.—Of coal, 92.48 per cent, and of cannel 7.52 per cent is used, the average net price being $2.27 per ton. Wigan (Lancashire) district is the source of supply.

Mr. Smith further stated that during the year ending March 25, 1890, the gross profit was $253,495.98; that 9,824 cubic feet of gas was made per ton of coal carbonized, and unaccounted-for gas was 5.93 per cent.

PRESTON.

Preston is a town in the county of Lancaster, situated 30 miles northwest from Manchester. The population of Preston, according to the last census, was 96,855.

Mr. Henry Green, the engineer and secretary of the Preston Gas Company, furnished me with the following replies to my queries:

Amount of money invested, $1,897,935.

Process of manufacture, distillation from coal, etc.

Candle power, about 19.

Approximate annual output, 413,000,000 cubic feet.

Number of consumers, 22,600 meters in use, exclusive of street lamps.

Price.—Seventy-eight cents per 1,000 cubic feet, less 15 and 20 per cent discount (according to consumption) for cash within twenty-one days. To a few districts outside the borough the price is 83½ cents, less the above discounts.

Gas stoves.—The price of gas for cooking and heating purposes is the same as for lighting.

Wages.—Firemen, $5.59 to $10.95 per week; stokers, $1.15 per day of twelve hours; time and a half Sunday; double time Christmas day and Good Friday. Timekeepers, fitters, joiners, and mechanics, $4.86 to $8.02 per week of fifty-four to fifty-five and a half hours; meter inspectors, $5.10 to $6.08 per week of forty-four to forty-six hours; laborers, $4.38 per week of fifty-five and a half hours.

Material used.—A mixture of cannel and coal from Wigan. Average price, about $2.92 per ton.

BURY.

Bury, in the county of Lancaster, had a population in 1881 of 52,126.

In reply to my queries, Mr. William Woodward, late engineer and manager of the Bury Corporation Gas Works, gave me the following information as to the manufacture and consumption of gas in Bury:

Amount of money invested.—The total amount of money invested in the department is $752,005.64, but this amount has been reduced to about $464,750 by means of the sinking fund, which provides for the total extinction of the indebtedness in twenty years and all new capital called up in twenty-five years.

Process of manufacture.—The destructive distillation of bituminous coal.

Candle power.—The gas act stipulates 15 candles, but 18½ candle power is the quantity always supplied.

Approximate annual output, 260,000,000 cubic feet.

Number of consumers, 15,200.

Price of gas per 1,000 cubic feet, 48 cents. [*Sic*].

Wages.—The wages of ordinary men vary from 85 cents to $1.09 per day, with an average of fifty-four and one-half hours per week of six

days. Stokers of retorts receive $1.21 per day of eight hours, with time and a half for Sunday work.

Material used.—Coal; purchased from the Wigan (Lancashire) and South Yorkshire districts. Price at the gas works, about $3.22 per ton.

STOCKPORT.

Stockport, in the county of Chester, lies 5¾ miles southeast of Manchester. Its population in 1881 was 59,544.

The extensive gas works are the property of the corporation, and afford a good annual income. In addition to the works, reserve cylinders and gasometers are situated in the town itself. There is an immense telescope gas-holder in the adjoining township of Heaton Norris, the diameter of which is 96 feet outside case, 94 feet inside, and 32½ feet deep; therefore with two 32½ feet lifts it rises nearly 64 feet, and is capable of storing 446,000 cubic feet of gas without calculating the rise of the top.

In reply to my questions Mr. James Jacques, the engineer and manager of the Corporation Gas Works of Stockport, gave the following replies:

Amount of money invested, $664,934.38.

Process of manufacture, destructive distillation in clay retorts.

Candle power, 20.43.

Approximate annual output, $427,393,300 cubic feet.

Number of consumers, 14,000.

Price of gas per 1,000 cubic feet, 60 cents.

Gas stoves.—Two hundred and thirty out on hire at 12 cents to $1.03 per stove per quarter.

Wages.—Stokers $9.24 per week, 12-hour shifts.

Materials used.—Cannel 90, coal 10 per cent, from Yorkshire, Lancashire, and Derbyshire.

WILLIAM F. GRINNELL,
Consul.

UNITED STATES CONSULATE,
Manchester, June 19, 1890.

NEWCASTLE-UPON-TYNE.

REPORT BY CONSUL PUGH.

Gas is manufactured here under circumstances more favorable, perhaps, than at any other place in the United Kingdom for the reasons that the city is the center of one of the largest and best coal fields of the world, the coal is a very superior quality, transportation cheap, and low wages paid for labor.

The following are the results of my investigation in condensed form of answers to the questions asked in your dispatch:

The area supplied by this gas company includes the city of Newcastle-upon-Tyne on the north side of the river in Northumberland County and Gateshead and its suburbs on the south side of the river in the county of Durham, containing a total population of about 275,000. The gas works are situate at Elswick in Newcastle and at Redheugh in Gateshead, but as the produce of each enters common supply pipes there is no means of ascertaining the proportion supplied to any of the above-named districts from either of the works.

The name of the company is the Newcastle-upon-Tyne and Gateshead Gas Company.

The amount of money invested in the industry is $3,908,718.29.

The process of manufacture is by carbonization of gas coal in clay retorts.

Candle power is 16 candles, as ascertained by a No. 1 London argand burner.

Approximate annual output, 1,743,945,000 cubic feet.

Number of consumers, 30,000.

Price of gas per 1,000 cubic feet, 48 cents per thousand, with a discount of 10 per cent to consumers of 400,000 cubic feet or less per quarter, and 15 per cent to consumers of more than that quantity.

Of gas stoves for cooking and heating there are 869 lent out on hire at a rental of 10 per cent on gross price of stove.

Wages of employés and hours of labor: Stokers, $9.24 per week, 8-hour shifts; mechanics, $7.20 to $9.50 per week of 54 hours; laborers, $4.80 to $6.86. Both stokers and mechanics are skilled workmen; the term "mechanics" includes machinists and engineers in charge of all the machinery.

The company uses what is called Newcastle gas coal, from the county of Durham, mixed with about 8 per cent of local cannel. Newcastle coal, $2.19 per ton; local cannel, $3.40.

HORACE C. PUGH,
Consul.

UNITED STATES CONSULATE,
Newcastle, May 1, 1890.

NOTTINGHAM DISTRICT.

REPORT BY COMMERCIAL AGENT M'KIM.

To the following table might be added the names of a few more towns in this district, in which gaslight has been used for several years; but it will probably furnish all the information required.

As a general rule in this part of England the manufacture and distribution of gas are not carried on by private individuals or companies, but in all except a few instances by the municipal corporations of the several towns. As a consequence of this arrangement, the service is

highly satisfactory, particularly in the city of Nottingham, the volume and quality of the gas maintained with steadiness, and the price kept from unnecessary fluctuation.

A good gas coal is mined in the close vicinity of almost all these towns; so that the cost of materials is practically about the same at each of the gas works.

The cost of labor stated is exact only as regards the principal cities and towns; as to the smaller, it is assumed that the price of a day's work is at least no higher, though a few skilled workmen may here and there be found to command a trifle more. The prices named are those paid to the common laborer and to the stoker respectively, and both classes are employed by the week of fifty-four or fifty-six hours.

The amount of capital given includes, of course, the whole plant of business—pipes, burners, and all necessary fixtures for streets, dwellings, and public buildings.

JOHN L. MCKIM,
Commercial Agent.

UNITED STATES COMMERCIAL AGENCY,
Nottingham, May 1, 1890.

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*Table exhibiting certain particulars of the gas industry in several cities and towns embraced within the commercial agency of the United States at Nottingham.**

Towns.	Population.	Capital invested.	Consumers.	Annual output.	Candle power.
				Cubic feet.	
Nottingham	250,000	$4,250,000	40,000	1,400,000,000	19
Leicester	180,000	3,400,000	23,350	1,000,000,000	17½
Derby	82,000	1,100,000	15,000	380,000,000	17
Newark	14,000	800,000	2,500	80,000,000	16
Rexford	9,000	350,000	2,000	40,000,000	16
Mansfield	13,000	750,000	3,000	85,000,000	18
Alfreton	5,000	120,000	1,000	25,000,000	16
Belper	10,000	200,000	2,300	60,000,000	18
Ilkeston	14,000	230,000	2,750	75,000,000	17
Grantham	17,000	300,000	3,200	100,000,000	18
Basford	23,000	500,000	3,750	140,000,000	18

Towns.	Price per 1,000 cubic feet.	Wages of employés.	Materials, and where obtained.	Gas stoves in use.
	Cents.	*Per week.*		
Nottingham	50 to 60	$8.75 to $9.50	Coal and lime†	12,000
Leicester	56	6.00 to 7.50	....do	3,500
Derby	50 to 60	5.75 to 8.00	....do	2,000
Newark	55 to 70	5.25 to 7.50	....do	.....
Rexford	60 to 75	5.50 to 7.75	....do	.....
Mansfield	55 to 70	6.25 to 8.00	....do	.....
Alfreton	60 to 75	6.00 to 7.50	....do	.....
Belper	60 to 80	5.75 to 7.75	....do	.....
Ilkeston	55 to 65	6.50 to 8.00	....do	.....
Grantham	55 to 75	6.75 to 8.50	....do	.....
Basford	50 to 60	8.00 to 9.50	....do	.....

* Process, distillation; price of coal, Derbyshire, $2.50; South Yorkshire, $3.75 per ton.
† Nottingham, Derbyshire, and South Yorkshire.

SHEFFIELD.

REPORT BY CONSUL FOLSOM.

The city of Sheffield has an estimated population of about 320,000.

The name of the gas company is the Sheffield United Gaslight Company.

Amount of money invested in the industry, $3,236,280.90.

The process of manufacture is the ordinary process for coal gas.

The candle power is 17¾.

The approximate annual output, 1,740,792,000 cubic feet.

Number of consumers, 46,500.

Price of gas per 1,000 cubic feet, 44 to 53 cents, the average price being 51 cents.

There are in use some thousands of gas stoves for heating purposes in this district, and 1,200 gas stoves are used for cooking.

Wages of employés: Gas stokers obtain $1.34 per day of 8 hours. Other classes of labor, various.

The material used is coal, obtained in South Yorkshire, the price being $2.50 per ton.

BENJAMIN FOLSOM,
Consul.

UNITED STATES CONSULATE,
Sheffield, May 14, 1890.

SOUTHWEST OF ENGLAND.

REPORT BY CONSUL DELILLE, OF BRISTOL.

INTRODUCTORY REMARKS.

Owing to the fact that electricty has not as yet been introduced there to any large extent, the gas industry in the southwesterly district of England is particularly flourishing, and yields lucrative returns on the capital invested in this branch of commerce. The hilly nature of the soil in many of the larger towns—such as Clifton (the fashionable suburb of Bristol) and Weston-Super-Marr, the principal watering place of this center—causes the illuminating power of the gas to be somewhat inferior and inadequate in certain districts, but on the other hand the proximity of rich coal mines, and the consequent cheapness of the material from which gas is manufactured, enable the gas companies to supply their customers at rates much lower than prevail in London and other towns farther inland.

BRISTOL.

Population.—To take Bristol, by far the most important town in this part of the country, first, we find this industry in a very prosperous state. Bristol is a large manufacturing town of some 206,000 inhabitants. It stands on the river Avon, about 7 miles from the sea, or rather the Bristol channel. Owing to the number of factories and business houses in the city the total of gas consumed reaches a high percentage of the population, to wit, 22,000.

Capital invested.—The name of the gas company is the Bristol United Gaslight Company, Limited. The amount of money invested in the industry is $3,815,489.

Candle power.—The candle power of the gas varies very considerably; 13½ is the lowest figure prescribed by law; but during part of last winter as high as 17.36 was supplied to certain consumers in the town.

Output.—The approximate annual output is somewhat difficult to estimate, for it has been steadily rising of late years. In 1889 it reached the total of 1,400,000 cubic feet.

Price of gas.—The price of gas used to be remarkably low in Bristol, that is, compared with other towns in England, viz, 52 cents per 1,000 cubic feet, but the strike among the employés of the gas works last winter was so severely felt by the company that they have had to raise their price no less than 10 cents per 1,000 cubic feet. The cost at present is therefore about 62 cents per 1,000 cubic feet.

Gas stoves.—On account of the old-fashioned structure of many of the houses in Bristol and Clifton (most of them being provided with inclosed ranges, etc.), the use of cooking stoves has not as yet attained much development in this part of the country, although the company has organized exhibitions of these useful inventions on several occasions. The secretary, Mr. Green, whom I have to thank for his promptness in affording me the information I sought, tells me that the company now have some 2,000 cooking stoves out on hire, and that the number is daily increasing. Still, speaking generally, it may be asserted that the gas industry in Bristol has as yet taken very little extension in this direction.

Wages.—It is beyond all question that the wages of employés used to be low in this section of the United Kingdom. This state of affairs, however, was done away with once and for all last winter by the serious strikes which took place then, and which have already been alluded to. The men struck for considerably higher wages, and their employers at once conceded their demands, the strike lasting barely two days. The wages on the present advanced scale are: Stokers, eight hours per day, seven days per week, $8.51 per week; ordinary hands, ten hours per day, five and a half days per week, $5.10 per week.

Process of manufacture.—To come to the process of manufacture and the kind and quality of the material used, it is noteworthy that this matter seems to be in a transition stage just at present. The company have had offered to them certain coals at a very much lower price than any they can now purchase. It is particularly interesting to American business men to learn that among the samples of new coals now under consideration by the Bristol United Gaslight Company are several specimens from the United States, which, if they but prove equal to the analysis, will be sure of universal adoption in this quarter of the kingdom. Some Australian coal also is being tested, for which a candle power of 13.6 is claimed concurrently with a large yield.

Sectional view of Gas Work, with Retorts, Furnace, Hydraulic Main, Coolers, Coke Condenser, Lime Purifier and Gas Holder.

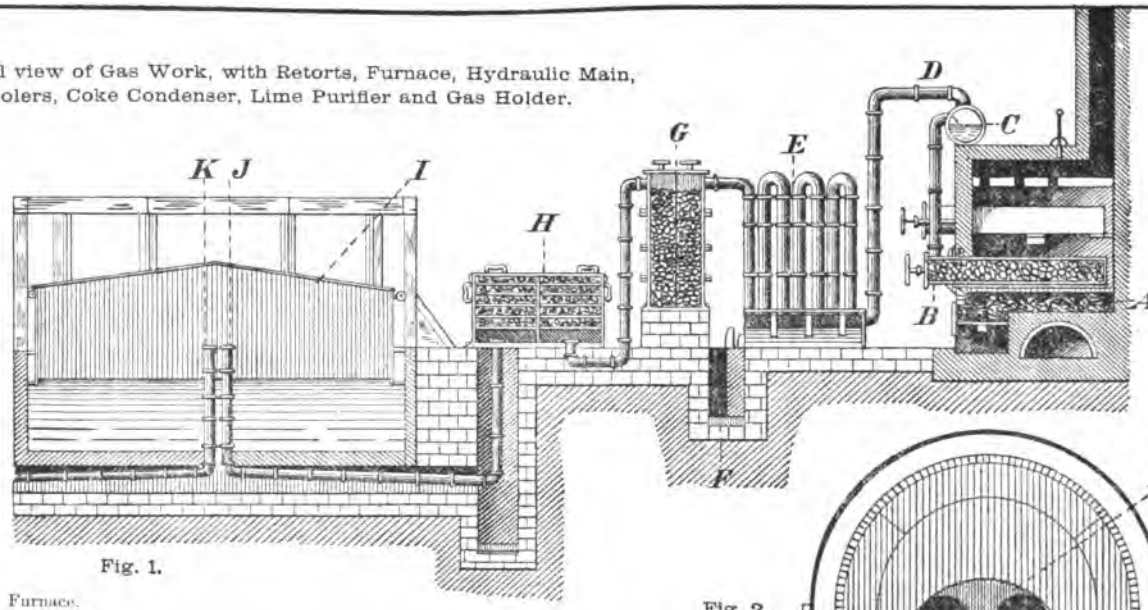


Fig. 1.

A. Furnace.
B. Retorts.
C. Hydraulic Main.
D. Dip Pipe.
E. Condenser.
F. Tar Well.
G. Washer.
H. Lime Purifier.
I. Gas Holder.
J. Ascension Pipe through water.
K. Supply Pipe to street mains.

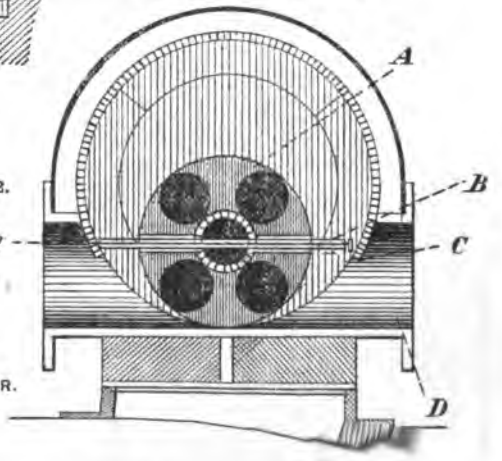


Fig. 2.

A. Axle.
B. Sliding Piston.
C C. Cylindrical holes bored in girder blocks.
D. Outlet.

Turning to the process of manufacture, it will perhaps be as well to describe carefully the process in use at the Bristol Gas Works, as this is substantially the same as is resorted to throughout the adjoining counties. One description will thus suffice as regards all the different companies enumerated. For the purpose of rendering this necessarily lengthy description as clear as possible a very rough sketch is herewith given of a sectional view of a gas work (Fig. 1), and of an exhauster (Fig. 2).

Gas has been obtained from wood, from oil, but now invariably from coal. The best sorts for the purpose are those bituminous coals known in England by the name of "cannel," and in Scotland by the name of "parrot." The apparatus in vogue at the Bristol Gas Works is on the destructive distillation principle, and consists of a furnace (A, fig. 1) with a set of D-shaped retorts (B, Fig. 1) connected by an ascension pipe with the hydraulic main (C, Fig. 1, a large cylinder made of thick plate or cast iron), whence dip pipes (D, Fig. 1) convey the gas to the condenser (E, Fig. 1), to the washer (G, Fig. 1), to the lime-purifier (H, Fig. 1), and lastly to the gas holder or gasometer (I, Fig. 1). The process of manufacture is as follows: The coals are introduced into the retort by means of a long narrow scoop. The mouth of the retort is then closed by a lid fixed by means of a screw and holdfast, the joint being made tight by luting with clay. The gases which are generated escape by the upright tube into the hydraulic main (C, Fig. 1).

A tarry liquor is here deposited which is discharged, when it rises above half the horizontal section, by a siphon pipe at the end of the cylinder into the tar well (F, Fig. 1). By this tarry liquid the orifices of the pipes from the retorts are closed, whereby the gas in the dip pipe (D, Fig. 1) is prevented from descending into the retort pipes and igniting in the retort. The hot gas which passes from the main still holds in suspension a considerable portion of tarry and ammoniacal vapors, which must be immediately abstracted, or they would condense in the distant parts of the apparatus. The gas is therefore made to pass through the condensers (E, Fig. 1), which consist of a number of upright tubes encased in larger ones containing water, which is kept cold by constantly flowing in at the bottom, and escapes in a stream at the top. The gas in passing through these cooled tubes is considerably reduced in temperature and the vapor of tar condenses into a liquid which is led into the tar well (F, Fig. 1). The exhauster (Fig. 2), when used, is the next part of the apparatus. It relieves the retorts of the resistance or pressure created in the passing of the gas through the apparatus, and in raising the gas-holders. The axle (A, Fig. 2), is reduced at each end and passes into two cylindrical boxes bored to a larger diameter than the axle at these parts, and in the annular space between the axle and the box, antifriction rollers are introduced, their diameter being equal to the width of the annular space; the box at one end is fitted with a stuffing block, through which the axle passes for the application of the

driving power. When the axle is set in motion the sliding piston (B, Fig. 2) is carried along with it. The ends of the sliding piston are furnished with cylindrical pins, which project and fit into cylindrical holes bored in the girder blocks (C C, Fig. 2) which fit into annular recesses in the end plates, and keep the slides in contract with the cylinder. As the axle continues to revolve, and one slide reaches the outlet at D (Fig. 2) and ceases to exhaust, the other comes into action. A portion of the ammonia and the sulphureted hydrogen and carbonic acid have still to be got rid of. For this purpose is employed the coke condenser or scrubber, in which the gas is made to pass through layers of coke, through which water may be made to percolate from the openings at top of the washer (G, Fig. 1). The gas then passes on to the lime purifier (A, Fig. 1), by means of which it is purified from the sulphureted hydrogen, a portion of the ammonia, and the carbonic acid.

There are two kinds of purifiers, the dry and the wet. The dry purifier (H, Fig. 1), such as is used in this district, is a rectangular iron vessel containing a series of perforated trays, on each of which the purifying material is placed. Slaked lime is used in this purifier in layers of from 2½ to 3½ inches on each tray. The vessel is divided into two compartments by a partition extending not quite to the top; the gas filters up through one compartment and down through the other. As the smell of the spent lime is very offensive, oxide of iron is frequently substituted and is used in the same manner, but spread on the trays to a greater thickness. A separate lime purifier, however, is necessary for removing the carbonic acid. The wet lime purifier, now seldom used, is a cylindrical vessel, into which the gas is conveyed by a wide pipe which descends through the center of the vessel and is furnished with a broad flange on the lower end. The vessel is filled with a mixture of lime and water to the height of several inches above the flange. The gas passes under the flange and forces its way up through the purifying material, which is constantly kept in motion by a stirrer, consisting of two revolving arms driven by a spindle passing through a stuffing box in the center of the cover of the vessel. It is then passed through the station meter, which registers the quantity of gas produced at any given hour. The internal construction of this apparatus is similar to that of the consumer's meter.

In connection with it there is a tell tale, which indicates every irregularity in the production of the gas during the twenty-four hours. In the center of the dial field a circular plate is fixed, connected with a train of wheel-work set in motion by an inclosed drum, through which the gas passes, indicating tens, hundreds, thousands, etc., of cubic feet of gas. Upon this circular plate is fixed a disk of paper, over which is placed a timepiece, to the minute hand of which is attached a detent, furnished with a pencil, pressing by a spring upon the disk. As the minute hand revolves, the pencil, by means of a guide fixed in the meter case, is regulated, so that in the first half hour it will trace a perpendicular line

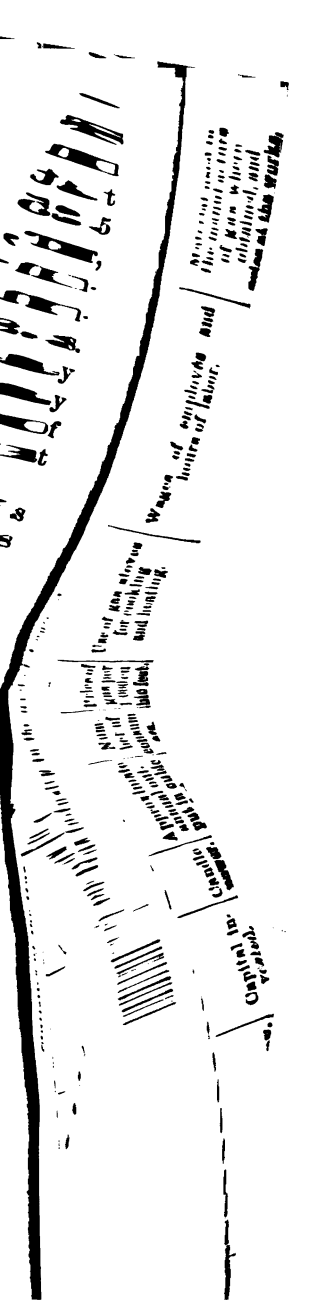
upon the paper in length equal to the diameter of the circle formed by the minute hand, measured from the center to the point at which the detent is fixed; in the second half hour the line would be retraced by the hand rising again. This arrangement supposes the disk to be stationary, but as it is made to revolve upon an axis, which is also the axis of the inclosed drum, the pencil will make a series of curved lines, meeting the divided circle of the disk every hour, and the distance traveled from point to point will mark the number of cubic feet of gas made every hour. If the production has been regular the penciled figure will also be so; if any neglect has occurred it will be detected by the irregularity of the figure, and the hour and amount of difference indicated.

From this meter the gas is next conveyed to the gas-holder. This is a large cylinder closed at the top and floating or suspended with its open end in a tank of cast iron or masonry containing water. A pipe (J, Fig. 1) ascends from the bottom of the tank through the water to admit the gas to the space between the water and the crown of the gas-holder. Another pipe (K, Fig. 1) descends through the water and the bottom of the tank, by which the gas is introduced into the street mains. The buoyancy of the gas raises the holder, the weight of which, or as much of it as is not taken off in some instances by balance weights, impels the gas through the pipes. The balance weights are attached to the edge of the crown of the gas-holder by chains, which pass over pulleys on the top of columns, which serve also to guide the motion of the vessel in rising or falling. In large works a telescope gasometer is used, and economy of space and cost thereby affected, two or more concentric cylinders being contained in one tank.

MISCELLANEOUS STATISTICS.

Turning from the subject of the process of manufacture to that of the amount of capital invested in the gas industry in this district, it may be observed that the total figure of the capital of the companies enumerated in the accompanying table denotes the great importance of this branch of commercial undertaking. As will be seen by reference to the aforesaid table of gas statistics, I have been able to gather full and substantial answers to all the queries contained in the Department circular, from no less than fourteen cities and small towns. The only exception—and that in respect of merely one item of information—is Clevedon, a small seaside locality, in connection with which all the gas statistics were kindly supplied, save the amount of money invested. Leaving, therefore, this small town out of count, and reckoning up the total sums invested in the gas industry in the remaining thirteen localities, we find that these figures reach an aggregate of no less than $6,825,119.92. It is thus evident that the gas interest is both substantial and widespread—a fact which may have something to do with the inadequacy of electric lighting in the southwest of England. At the same time it is

me weeks ago the leading members of the local elec-
ɔe visited London and inspected several installations
ıt with a view, of course, to its general introduction
ıe country. They ultimately formed the opinion that
ɣorable circumstances the light would cost Bristol 25
ı is now being paid for gas. I understand, however,
a well-known local electrician, who is advising the com-
ɔo think the light may be introduced here with advan-
ıyers, and can be made even commercially a success.
ı-pressure alternating current system, though it may
o whether the central portion of the city may or may
mically served from a station in the neighborhood o
pressure, leaving the other districts to be supplied a



that the price of gas is now somewhat high. Th
ıtrikes in Bristol and district, no less than 10 cen
t representing the increase in charge since the pr

rk applies to wages. These have risen all round
ery case, successful issue of the labor agitations at the
ıresent year. As will be seen by the accompanying
wages has now reached what for England must be
fair figure, showing, at all events, a much higher
than workmen in this district have been hitherto

t of gas stoves for cooking purposes may be said to
rt only within the past few years. Their use will
ıuch in the future, especially as the gas company fre-
bitions of both cooking and heating stoves and the
n this line of apparatus and appliance.

seems safe to assert that the gas industry in the
and is at present in a very prosperous condition; and
ll probably elapse before electricity is introduced on
make it a dangerous rival for the less modern light.

JOHN D. DELILLE,
Consul.

ɜ CONSULATE,
ıtol, October 16, 1890.

Statistics of the Gas industry in the west of England.

Name of town.	Population.	Name of gas company.	Capital invested.	Candle power.	Approximate annual output in cubic feet.	Number of consumers.	Price of gas per 1,000 cubic feet.	Use of gas stoves for cooking and heating.	Wages of employés and hours of labor.	Material used in the manufacture of gas, where obtained, and price at the works.
Bristol.....	206,874	The Bristol United Gaslight Co., Limited.	$3,815,491.72	{*13½}	1,400,000,000	22,000	$0.62	2,000 cookers let out.	Stokers, $8.50 per 7 days of 8 hours; other hands, $5.10 per 5½ days of 10 hours.	Scotch cannel, average cost, $2.12 per ton.
Gloucester.....	36,521	Gloucester Gaslight Co., Limited.	493,949.75	17	180,000,000	3,300	.60	Gas stoves largely used; no figures given.	Stokers, $1.21 per day of 12 hours; mechanics, 12 to 14 cents per hour, 9 hours per day; laborers, $4.38 to $5.10 per week, 9 hours per day.	Coal, principally South Yorkshire and North Wales.
Bath.....	51,790	Bath Gaslight and Coke Co.	985,466.25	16	397,000,000	7,400	.64	800 let on hire, and many others in use.	Stokers, $8.50 per 7 days of 8 hours; engine men, $6.56 per 7 days of 12 hours; laborers, from $3.89 per 6 days of 9 hours.	Coal from Somerset and North of England.
Cheltenham....	43,972	Cheltenham Gaslight and Coke Co.	768,907.00	16.48	288,859,000	5,940	.60	Let on hire	No particulars given.....	No particulars given.
Weston super Mare.	16,000	Weston super Mare Gas Co.	194,660.00	17½	67,498.000	1,470	‡.85	A few cooking stoves let on hire.	Ranging from $9.48 to $5.59 per week, per day of 10½ hours.	Screened coal from Bristol and South Wales. Can not give prices.
Stroud.....	7,533	Stroud Gaslight and Coke Co.	145,995.00	16	68,000,000	1,500	.77	Very few used....	$7.29 per week of 8 hours per day.	Coal from North and South Wales.
Trowbridge ...	11,000	British Gaslight Co, Limited.	115,034.00	14	41,750,000	1,308	.81	About 100 on hire.	From 60 to 97 cents per day of 10 hours.	Coal from Somerset; about $3.89 per ton.
Bridgewater...	12,024	Bridgewater Gaslight Co.	93,923.45	15	42,000,000	830	.73	No particulars given.	Head stokers, $6.80 per week of 7 days; laborers, $6.32.	Coal from South Wales; about $3.89 per ton.
Cirencester....	9,000	Cirencester Gaslight and Coke Co.	77,864.00	16	26,000,000	700	.95	....do	Stokers, $6.56; laborers, $4.38 per week, per day of 12 hours.	Yorkshire coal, $4.80 per ton.
Chippenham...	4,495	Chippenham Gas Co., Limited.	38,932.00	16	15,000,000	329	.91	None used.....	No particulars given.....	Radstock coal, $4.38 per ton.
Glastonbury...	7,000	Glastonbury Gas and Coke Co., Limited.	38,932.00	16	8,000,000	300	.91	A few on hire.	$5.34 per week, 12 hours shift.	Radstock coal, $3.89 per ton.
Portishead.....	3,000	Portishead Gas Co., Limited.	29,199.00	17	5,000,000	.....	.97	....do	No particulars given.....	Coal from South Wales.
Shepton Mallet.	5,322	Shepton Mallet Gas and Coke Co.	26,765.75	18	9,000,000	250	§.97	Fair quantity on hire.	$4.86 per week, 12 hours.....	Radstock coal, $3.89 per ton.
Clevedon	6,000	Clevedon Gas Co.....	Not given...	15	25,000,000	530	1.09	A few on hire, at 10*s.* per annum.	$4.86 and $5.34 per week, 12 hours.	Coal, at $3.65 per ton, at works.

*Prescribed. †Supplied. ‡Less 20 per cent. §Less 5 to 15 per cent.

WEST RIDING OF YORKSHIRE.

1. Leeds.
2. Wakefield.
3. Batley,
4. Dewsberry.
5. Pontefrect.
6. Knaresborough.
7. Ackworth, Featherstone, etc.

REPORT BY CONSUL WIGFALL, OF LEEDS.

LEEDS.

Leeds, on the River Aire, is 185 miles from London, 75 miles from Liverpool, 55½ miles from Hull, and 200 miles from Glasgow and Edinburgh. Its population, estimated for the middle of the year 1890, is 363,799.

The township of Roundhay and small portions of the townships of Rothwell, Shadwell, and Adel-cum-Eccup are supplied with gas by the Leeds Corporation Gas Department, in addition to the service of the borough of Leeds. The area of the borough of Leeds is 21,572 acres, and it has a circumference approximating 30 miles in extent.

The parliamentary return for the year ended December 31, 1888, gives the acts of 1870, 1877, and 1883, incorporating earlier acts of 1853 and 1863, and 1854, 1862, and 1868, as the authority under which the Leeds corporation was working in the matter of the gas supply.

The amount of loan, together with the amount of capitalized value of annuities which was authorized for purposes of gas undertakings, was at that date $6,083,125. Loan to be repaid and annuities redeemed within sixty years from 1877. Amount actually borrowed, including capitalized value of annuities, $4,893,426.34, not deducting amount repaid. Interest had been paid at the rate of 3½ and 4½ per cent.

Total amount of loan repaid is given as $567,156.51, and amount placed to sinking fund $325,778.11 or a total of $892,934.62. In the year under consideration (1888):

Interest paid on loan was		$191,487.04
Placed in sinking fund		45,784.03
Total		237,271.07
Receipts	1,077,895.68	
Expenditures	869,677.62	
		208,218.06
Being a deficiency on the year's work of		29,053.01

after reckoning for interest paid and sum placed to sinking fund, as already set forth. (It may be noted here that the pound sterling is reckoned at $4,8665, and the sums approximated, in order to work out convertibly.)

The present (1890) process of manufacture is stated to be as follows: Coal is carbonized in retorts set in beds of 5s, 6s, 7s, 8s, and 9s in one arch, the two latter being set on Siemens's latest improved regenerator

principle. The gas is subsequently condensed, washed, purified, and registered by station meter prior to being passed into the gas holder.

According to the return of 1888, the candle power prescribed was 16; candle power supplied, 17, as tested by 15-hole Argand burner, and 19 by 24-hole burner.

The 1888 return gives output for year 2,164,554,600 cubic feet of gas from 219,661 tons of coal carbonized, and the present rate of production is reported very slightly larger.

The consumption in 1888 was: Private consumers, 1,764,780,300 cubic feet; public lamps, 116,829,600; total, 1,881,609,900 cubic feet (exclusive of consumption at works).

In 1890, the consumption, inclusive of amount used at works, is estimated at about 1,925,000,000 cubic feet, of which about 1½ per cent was reckoned to have been used on works.

Number of consumers (1890), about 72,000; number of public lamps, 8,420; used on works, about 1½ per cent.

In 1888, the length of the gas mains was about 678 miles.

The price of gas has been recently advanced from 45 to 53 cents per 1,000 cubic feet, with 5 per cent discount if paid within one month from delivery of account; accounts rendered semiannually, in January and July to last day of preceding months; payment within two months is allowed 1½ per cent discount.

Annexed list shows the yearly meter rents:

2 light meters	$0.49	100 light meters	$6.33
3 light meters	.49	150 light meters	8.76
5 light meters	.73	200 light meters	10.95
10 light moters	1.10	250 light meters	12.90
20 light meters	1.70	300 light meters	14.60
30 light meters	2.55	400 light meters	16.06
50 light meters	3.89	500 light meters	17.76
60 light meters	4.38	600 light meters	19.47
80 light meters	5.35		

The corporation has about 900 gas stoves out on hire for cooking purposes. For heating they have no separate reckoning, the gas being charged according to the meter reading. It is stated, however, that 270 gas engines are in operation, representing 860 horse power.

Wages of employes are as follows: Stokers, $1.22 per day; purifiers, 97 cents to $1.05; coal wheelers, 97 cents; yard men, 89 cents; firemen, $1.22

Hours of labor: Stokers, coal wheelers, and firemen, 8-hour shifts; purifiers and yard men, 9-hour shifts.

The material used in the manufacture of gas is reported to be gas coal, gas nuts, and cannel. It is obtained from the local coal fields and from the Barnsley and Nottingham districts. Barnsley and Nottingham are respectively 19 and 72 miles from Leeds. The cost delivered at the gas works is about $2.15 per ton, average, for gas coal and nuts; and $3.57 per ton, average, for cannel.

WAKEFIELD.

Wakefield is a cathedral city 9 miles from Leeds, with an estimated population of 33,000.

The town is supplied with gas by the Wakefield Gas Light Company, under acts of Parliament of 1847, 1856, and 1877.

With an authorized capital liability of $754,307.50, there had in 1888 been paid up $539,222.80, including $28,240.30 by way of premiums. Standard rates for sliding scale ranged from 7 to 10 per cent. Dividends paid year ending December 31, 1888, were at the rate of $7\frac{7}{10}$, $8\frac{1}{4}$, and 11 per cent. Borrowing power at that date existed to the extent of $91,003.55, which had been utilized to the extent of $28,712.35, on which interest was paid at $3\frac{1}{2}$ per cent. Of the authorized capital $364,987.50 was subject to auction clauses, and $121,662.50 was thus sold, realizing a premium, as above mentioned, of $28,240.30.

Total revenue receipts in 1888 were $145,070.37; total expenditure same time, $87,246.62; balance carried to profit and loss account, $57,823.75.

The gas is made from coal, by distillation. Candle power in 1888, prescribed, 15; supplied, 17. Number of cubic feet of gas produced in 1888, from 23,173 tons of coal, 221,555,000; private consumers, 168,853,900; public lamps, 15,475,270; total 184,329,170 cubic feet (exclusive of consumption at works). Gas mains were $59\frac{1}{2}$ miles in length. Number of consumers, 4,906; number of public lamps, 1,213.

Price of gas: Initial price for sliding scale, 85 cents in 1888. The return drops type in stating actual price, which, however, would probably be something like 85 cents per 1,000.

Meter rent: Private consumers, 61 cents for 3-light meter, to $9.73 for 200-light meter.

Subsequently to the preparation of these figures the letter whereof a copy is annexed has been received from Mr. Whitaker, secretary and manager of the Wakefield Gaslight Company. This letter, written in reply to an inquiry made by me on the 13th instant, was delayed, and the item of my report with regard to the present price of gas at Wakefield was conjecturally based on information since shown to be wrong.

The report states initial price for sliding scale at 85 cents in 1888, which is correct, but as appears from Mr. Whitaker's communication the present actual price is 61 cents, both to private and to public consumers, and without discount.

The letter itself indicates a safeguard provided for the consumer against increase of charge for gas made with a view to obtaining larger profits to the company supplying it, since the creating authority limits the dividend, except upon condition that the price of the gas is reduced

GASLIGHT COMPANY'S OFFICE,
Wakefield, May 16, 1890.

F. N. WIGFALL, Esq.:

DEAR SIR: I have pleasure in replying to your further inquiry: Price to private consumers, 2*s.* 6*d.* (61 cents) per 1,000 cubic feet; the same to public lamps, etc.; in fact, we have only one uniform rate and no discounts.

This company in 1877 got a new capital act and was also placed under the provisions of the sliding scale, which enacts that all capital shall be either sold by tender or public auction, and the premium from such sale shall be taken to capital account but not bear dividend, so that the public get the benefit as well as the shareholder in issuing new capital.

The standard price is fixed in the act (in our case 3*s.* 6*d.* (85 cents) and is an inducement to the public and the company to reduce the price, the former by using it liberally and the latter by strict economy, for as we reduce the price by every penny per 1,000 cubic feet, we raise the dividend 5 shillings per cent, so that a reduction of 4 pence allows an increase in dividend of 1 per cent, or *vice versa* with an advance in price above the standard rate.

The old acts had a maximum price of gas and also a maximum dividend, which, with a successful company, encouraged a sleepy existence when the maximum was reached.

Yours, truly,

JOHN W. WHITAKER,
Secretary and Manager.

It may be added by way of explanation that the expression 5 shillings per cent means 5 shillings to the £100 sterling. There being 20 shillings to each pound, 5 shillings per cent is equivalent to one-fourth of 1 per cent, and four times that rate would be 1 per cent; hence, if 1 penny per 1,000 reduction in price permitted an increased dividend to the extent of one-fourth per cent, a reduction of 4 pence per 1,000 would allow a dividend increase of 1 per cent, as stated by Mr. Whitaker. The federal equivalents stated in parentheses in the copy of Mr. Whitaker's letter are inserted in copying, not being in the original.

About 500 gas stoves are known to be in use (1890). Proportion as to heating or cooking not at hand.

Stokers' wages, $1.09 per day; maximum weekly, $7.30; minimum weekly, $5.11. Hours of labor for stokers, 12; for ordinary hands, 6 a. m. to 5:30 p. m.

Material used, coal; no cannel; obtained within a radius of 3 miles of the city; cost, delivered at gas works, about $1.95 per ton.

BATLEY.

Batley is a municipal borough about 8 miles from Leeds. It has an estimated population of 33,000.

The town is supplied with gas by the Batley corporation gas works, whose service extends to a part of Upper Soothill as well.

The amount of liability authorized under the Dewsbury and Batley corporations gas act of 1873 is $1,070,630. This indebtedness is limited to the term of sixty years from 1873. Total amount which had been borrowed to June 30, 1885, was $821,971.32. Rate of interest was 3½ per cent. There had been placed to sinking fund, $58,037.88.

Gas is made by carbonization in clay retorts.

Candle power (in 1888) prescribed, 14; supplied, 17.5. Annual output in 1888, 129,000,000 cubic feet of gas from carbonization of 12,500 tons of coal.

Consumption: Private consumers, 117,893,000 cubic feet; public lamps, 10,005,000; total, 127,898,000 cubic feet (exclusive of consumption at works).

Length of gas mains (1888), 42½ miles; number of consumers, 5,641 number of public lamps, 697 Batley, 70 Upper Soothill.

Price of gas: Private, 83 cents; Batley 5 per cent discount; 89 cents Upper Soothill, 5 per cent discount. Price of gas, public, 37 cents Batley, 73 cents Upper Soothill; maximum authorized, $1.10.

Annual meter rent, from 49 cents for 2-light meter to $8.52 for 100-light meter.

Gas stoves for heating are thought now to be used to a fair extent; 87 stoves are out on hire by the corporation for cooking.

Wages paid are: Stokers, $1.22 for 50 cwt., 8-hour shifts; laborers, 51 hours per week, at $5.11 per week.

Material used is bituminous coal, obtained in the neighborhood at a cost of $1.95 per ton delivered at the works under present contract, which is ten months old (in April, 1890).

DEWSBURY.

Dewsbury is a municipal and parliamentary borough about 8 miles from Leeds. It has a population estimated at 33,000. The town is supplied with gas by the Dewsbury corporation gas works, whose service extends also to parts of Thornhill, Soothill Nether, and Soothill Upper.

The amount of liability authorized under the Dewsbury and Batley gas act of 1861 and the Dewsbury and Batley corporations gas act of 1873 is $1,119,295. This indebtedness is limited to terms of forty-five and sixty years. The total amount which had been borrowed up to March 25, 1889, was $1,101,206.22. Rate of interest 3¼ to 4½ per cent. At same date there had been—loan repaid, $96,794.69; to sinking fund, $39,618.18; total, $136,412.86.

Gas is made by the ordinary processes. Candle power (1889) prescribed, 14; supplied, 18.68. Output, year ended December 31, 1888, 174,342,500 cubic feet of gas from 16,354 tons of coal carbonized. Consumption: Private consumers, 138,368,100 cubic feet; public lamps, 13,629,400; total, 151,997,500 cubic feet (exclusive of consumption at works).

Length of gas mains, 48¼ miles; number of consumers, 6,677; number of public lamps, 952, which the last half year of 1888 were supplied free of charge.

Price of gas (1889): Private, 73 cents, 2½ and 5 per cent discount, according to consumption; public lamps: Dewsbury, free of charge;

Thornhill, Soothill, Nether and Upper, 73 cents; discount, 2½ and 5 per cent. Maximum price authorized, $1.10. Annual charge for meter rent: Wet meters, 49 cents for 2-light meter to $17.03 for 250-light meter; dry meters, from 61 cents for 2-light meters to $17.03 for 250-light meter.

Gas stoves for heating and cooking use about 6 per cent of the gas consumed.

Wages paid are: Stokers, $1.22 per shift of eight hours; laborers, 93 cents to $1.01 per day; fitters, $1.10 to $1.58 per day. Hours of labor, in retort house, eight per day; other men, 50½ per week.

Material used in manufacture is best gas coal and cannel coal, which are obtained from Yorkshire for gas coal and from Derbyshire for cannel, at an average cost of about $2.19 per ton delivered at gas works.

PONTEFRACT.

Pontefract is a municipal burough 13 miles from Leeds, with a population of 8,798.

The Pontefract Gas Company supplies gas to Pontefract, Panshelf, and Carlton. The company is organized under act of Parliament of 1873, with a total capital authorized of $155,728, of which was paid up at December 31, 1888, $101,223.20. The maximum dividends authorized are 10 and 7 per cent, which rates were paid in 1888.

Loan capital authorized, $38,932, but none issued.

Total receipts for revenue account (1888), $23,276.47; expenditure, $13,743; balance carried to profit and loss, $9,533.47.

Gas manufactured in retorts and purified by oxide and lime.

Candle power (1888) prescribed, 14; supplied, 17½; output, 26,188,000 cubic feet of gas from 2,871 tons of coal carbonized.

Sold to private consumers, 22,891,000 cubic feet; public lamps, 2,177,543; total, 25,068,543 cubic feet (exclusive of consumption at works).

Gas mains are (1888) 9¾ miles in length; number of consumers, 655; number of public lamps, 199.

Maximum price of gas authorized, $1.34 per thousand; actual price of gas charged (1888), 75 cents, public and private. Meter rent, private consumers, 61 cents. Gas stoves are very little used.

Wages paid, $7.66 per week. Hours of labor, twelve per day.

Coal is used for making gas and is obtained in Yorkshire. It costs, delivered at gas works, $2.55 per ton.

KNARESBOROUGH.

Knaresborough is a market town, 18 miles from Leeds, with a population of about 5,000.

The Knaresborough Improvement Commissioners, a municipal board under act of Parliament of 1823, control and provide the gas supply.

The sum of $24,332.50 was authorized to be raised for gas undertaking and other purposes, of which $18,006.05 was employed for the gas.

Interest at 4 per cent has been paid and $486.65 placed to sinking fund up to March 25, 1889.

Gas is made by the usual process for making coal gas.

A candle power of 17 was supplied in 1889.

Production of gas, year ended March 25, 1889, 15,335,000 cubic feet, from 1,500 tons of coal carbonized.

Consumed: Private consumers, same time, 10,721,600 cubic feet; public lamps, 1,282,400; total, 12,004,000 cubic feet (exclusive of consumption at works).

Gas mains were three miles long.

Number of consumers, 494; public lamps, 138 (10 free of charge).

Price of gas: Private consumers, 61 cents; public lamps, $973.30, for gas, lighting, cleaning, and repairing.

About 100 gas stoves are in use; for heating, about 30; for cooking, about 70.

Wages of foremen, $6.81 and $6.33 per week; ordinary stokers, $4.87; and laborers, $4.38 per week; work ten hours per day.

Coal and lime are used for manufacture of gas. Coal is obtained from Brancepeth Colliery, Durham, and lime from Ord & Maddison, Darlington. Coal costs $3.28 per ton and lime $4.01 per ton, both delivered at gas works.

ACKWORTH, FEATHERSTONE, ETC.

Ackworth, Featherstone, Purston, and Sharlston are villages lying two or three miles south and west from Pontefract and about thirteen miles from Leeds. The population of the district is about 6,000, and it is supplied with gas by the Ackworth, Featherstone, Purston and Sharlston Gas Company, limited, organized under act of Parliament of 1880. Its authorized capital is $145,995, of which $48,665 was paid up December 31, 1888. Dividend of 6 per cent was paid in 1888. Loan capital authorized, $36,498.75, including debenture stock. None had been issued in 1888. Standard rates for sliding scale were 10 and 7 per cent.

Total receipts revenue account (1888), $6,998.03; total expenditure, $3,854.27; balance carried to profit and loss, $3,143.76.

Manufacture of gas is by means of clay retorts.

Candle power prescribed (1888), 14; supplied, 16.

Annual output of gas in 1888, 6,286,300 cubic feet. Private consumers, numbering 235, took 4,820,900; public lamps, numbering 80, 1,000,000; total 5,820,900 cubic feet, exclusive of amount consumed at works.

Nine hundred and eleven tons of coal carbonized in 1888. Gas mains 9 miles in length.

Price of gas (1888) to private consumers, 89 cents, $1.12, and $1.22; 5 per cent discount in some cases.

For public lamps, 80 in number, lighting and cleaning $759.17, and in addition for morning lighting, $175.19.

Gas stoves are little used; perhaps about half a dozen in the district.

Two stokers (firemen) receive $6.08 per week, and $6.57 in winter; hours of labor, 12 per day.

Material used, double screened Haigh Moor nut coal, obtained from Featherstone Main Colliery Company, near Pontifract, and costs $1.80 per ton delivered at gas works on contract made early in 1889.

F. H. WIGFALL,
Consul.

UNITED STATES CONSULATE,
Leeds, May 16, 1890.

SCOTLAND.

EDINBURG AND LEITH.

REPORT BY CONSUL WALLACE BRUCE.

In presenting my report on the gas industry in this consular district I respectfully submit a statement, arranged in tabulated form, setting forth most of the towns in which there are gas works within the district, and showing answers, so far as could be obtained, to seven of the questions contained in the circular calling for the report. The seven questions are as follows:

1. Names, localities, and populations of cities using gas.
2. Name of gas company.
3. Amount of money invested in the industry.
5. Candle power of gas.
6. Approximate annual output.
7. Number of consumers.
8. Price of gas per 1,000 cubic feet.

The other questions contained in the circular are answered in the subject-matter which follows the tabular statement.

Tabular statement relative to gas undertakings within the consular district of Edinburg and Leith.

Name and locality.	Population.	Name of gas company or by whom owned.	Money invested in the industry.	Candle power of gas.	Approximate annual output.
					Cubic feet.
Armadale, Linlithgow	.....	Company	$4,866.50	.....	.....
Bathgate, Linlithgow	5,000	....do	14,599.50	.....	6,870,000
Berwick on Tweed	14,000	....do	52,850.19	.....	22,317,300
Bóness, Linlithgow	6,500	....do	17,032.75	.....	11,192,900
Bonngrigg and Lasswade, Edinburg.	4,000	....do	12,166.25	.....	6,700,000
Corstorphine, Edinburg	800	Company, limited	8,273.05	.....	1,600,000
Dumfries, Dumfries	21,000	Dunfries gas commissioners.	160,594.50	*14 †27	52,000,000
Dunbar, Haddington	5,396	Corporation	34,065.50	*14 †30	5,171,000
Duns, Berwick	2.600	Company	6,813.10	.....	400,000
Edinburg and Leith, Edinburg.	349,673	Edinburg and Leith corporations gas commissioners.	5,220,284.81	*20 †27	390,970,000
Eyemouth, Berwick	3,000	Company	5,839.80	.....	1,340,400
Galashiels, Selkirk and Roxburg.	18,000	....do	102,196.50	.....	58,200,000
Gorebridge, Edinburg	1,300	....do	2,919.90	.....	1,000,000
Grangemouth, Stirling	5,000	....do	.....	.....	9,833,800

* Number of candles prescribed. † Number of candles supplied.

Tabular statement relative to gas undertakings within the consular district of Edinburg and Leith—Continued.

Name and locality.	Population.	Name of gas company or by whom owned.	Money invested in the industry.	Candle power of gas.	Approximate annual output.
					Cubic feet.
Haddington, Haddington	4,000	Company	$19,466.00		7,194,100
Hawick, Roxburg	20,000	do			46,000,000
Innerleithen, Peebles	3,400	do	14,509.50		8,236,900
Jedburg, Roxburg	4,000	do	24,819.15		6,400,000
Kelso, Roxburg	5,000	do			11,231,800
Lauder, Berwick	720	do	4,379.85		503,400
Linlithgow, Linlithgow	5,000	do	4,866.50		7,000,000
Melrose, Roxburg	2,000	do	14,509.50		4,800,000
Mid and East Calder, Edinburg.	1,600	Company, limited	7,786.40		1,000,700
Moffat, Dumfries	2,100	do	17,032.75		5,740,500
Musselburg, Edinburg	10,000	Musselburg Gas Light Company.	80,297.25	*22 †26.80	22,310,000
North Berwick, Haddington		Company			6,000,000
Peebles, Peebles	5,800	do			10,207,700
Penicuik, Edinburg	5,000	do	38,932.00		14,667,700
Portobello, Edinburg	7,000	Company, limited	97,330.00		28,240,000
Selkirk, Selkirk	7,000	Company	22,069.57		18,207,700
Stow, Edinburg	600	Company, limited	3,893.20		1,000,500
Tranent, Haddington	2,330	do			1,554,600
West Linton, Peebles	350	Company			200,000
Whitburn, Linlithgow	1,200	do	4,866.50		1,250,000

* Number of candles prescribed. † Number of candles supplied.

Name and locality.	Consumers.	Average consumption of gas per consumer.	Price per 1,000 cubic feet.		Maximum daily make of gas.	Capacity of holders.
			Ordinary consumers.	Public lamps.		
		Cubic feet.			*Cubic feet.*	*Cubic feet.*
Armadale, Linlithgow			$1.41	*$2.31		10,000
Bathgate, Linlithgow			1.01	.73	40,000	24,000
Berwick on Tweed		11,714	1.09	1.09	114,000	100,000
Bóness, Linlithgow		11,100	.96	†3.77	60,000	28,000
Bonngrigg and Lasswade, Edinburg		10,000	1.06	1.06	34,000	25,000
Corstorphine, Edinburg		10,000	1.66			40,000
Dumfries, Dumfries	2,990		.85	.85	300,000	300,000
Dunbar, Haddington	540		1.42	2.92	28,000	42,000
Duns, Berwick			1.42	1.42	15,000	16,000
Edinburg and Leith, Edinburg	61,920		.85	.61	6,300,000	6,400,000
Eyemouth, Berwick			2.02	2.02	10,000	5,800
Galashiels, Selkirk and Roxburg		12,640	.71	.71	393,300	312,000
Gorebridge, Edinburg		6,600	1.42	1.42	5,000	6,000
Grangemouth, Stirling			.91	.91	56,500	39,500
Haddington, Haddington		5,000	1.21	1.21	41,000	36,000
Hawick, Roxburg			‡.76	.§76	300,000	460,000
Innerleithen, Peebles			1.21	1.21	62,000	30,000
Jedburg, Roxburg		12,500	1.42	1.42	40,000	28,000
Kelso, Roxburg		12,500	1.01	1.01	67,000	55,000
Lauder, Berwick			2.33	1.55	2,500	8,400
Linlithgow, Linlithgow			1.11	1.11	44,000	23,000
Melrose, Roxburg		10,000	1.26 to 1.36	Free	25,000	22,000
Mid and East Calder, Edinburg		5,000	2.02	Free	5,300	5,000
Moffat, Dumfries		9,100	1.21	2.73	31,000	53,000
Musselburg, Edinburg	1,460		.97	‖.91	114,200	52,000
North Berwick, Haddington			1.42	1.42		16,000
Peebles, Peebles			1.11	1.11	63,000	41,000
Penicuik, Edinburg			1.15	1.15	80,000	50,000
Portobello, Edinburg		16,000	.97	.97	143,000	210,000
Selkirk, Selkirk		12,680	.81	*5.22	116,000	61,000
Stow, Edinburg		9,400	1.72	*.85		12,000
Tranent, Haddington			1.32	‖1.32	10,000	7,000
West Linton, Peebles			2.43	2.43		1,500
Whitburn, Linlithgow		5,000	1.42	1.42	5,000	8,000

* Each.
† All night, $6.81 each.
‡ Less 2½ to 7½ per cent discount.
§ Less 7½ per cent discount.
‖ Less 2½ per cent.

Process of manufacture.—The manufacture of gas in this district is chiefly conducted in fine clay retorts 9 feet long by 21 by 15 inches inside measurement, shaped thus, ⌂, and laid horizontally. Some of the settings are of the ordinary open type of fixing with ordinary air supply and top flues, others are on the Siemens patent refrigerator system with certain modifications, but there is no process of manufacture at work in Scotland different from the horizontal.

Gas stoves.—Since the introduction of the hiring-out system of gas stoves for heating and cooking purposes by the Edinburg and Leith gas commissioners about twelve months ago, more than 150 are now in use within the limit of their operations, and the system is daily becoming more popular. Such is also the experience of other leading gas companies in Scotland.

Wages.—The following may be accepted as a representative range of the rates of wages throughout this district: Wages of stokers, 15 cents per hour, working eight hours per shift, seven shifts per week; barrow men, 12 cents per hour, working eight hours per shift, seven shifts per week; yardsmen and laborers, 10 cents per hour, working fifty-one hours per week.

Material used.—The material used is splint and cannel coal mined in the counties of Edinburg, Haddington, Linlithgow, Fife, and Lanark. I am informed there are upward of 370 varieties of coal to choose from. The prices range from $2.43 to $7.30 per ton delivered at the works.

Miscellaneous.—Additional to the cities and towns named on the foregoing table there are within this consular district the following small towns possessing gas works, the details of which are similar to those of other small towns herein tabulated: Aberlady, Haddington, population very small; Coldstream, Berwick, population 1,616; Dalkeith, Edinburg, population 6,931; Dreghorn, Edinburg, population 928; Earlston, Berwick, population 1,010; East Linton, Haddington, population 1,042; Prestonpans, Haddington, population 2,265; South Queensferry, Linlithgow, population 1,966; West Calder, Edinburg, population 2,291.

By far the largest gas works in this consular district, as appears by the foregoing statement, are those of the Edinburg and Leith corporations gas commissioners, the amount of money invested in them being $5,220,284.81, and their approximate annual output 390,970,000 cubic feet.

Of the various rates in the price per thousand cubic feet of gas, the maximum charge to ordinary customers is $2.43, being that of a small company in West Linton, and the minimum is 71 cents, the price charged by the Galashiels Gas Company, while the average is about $1.28.

For public lamps the maximum charge is $2.92 per thousand, made by the corporation of Dunbar, and the minimum 61 cents, by the Edinburg and Leith corporations gas commissioners, the average being $1.31. In a few of the towns indicated on the statement the gas supply for public lamps is charged so much for each lamp, the maximum

being $5.22, as rated in Selkirk, the minimum 85 cents in Stow, the average being $2.77 each. The companies in two localities, Melrose and Mid and East Calder, supply gas to public lamps free.

WALLACE BRUCE.
Consul.

UNITED STATES CONSULATE,
Leith, May 20, 1890.

GLASGOW DISTRICT.

REPORT BY CONSUL BROWN.

To enable me to properly respond to the inquiry of the Department as to gas supply and consumption in this consular district I addressed letters of inquiry to the managers of gas works at a number of the cities and towns of the district, receiving prompt and satisfactory replies from the following: Glasgow, Greenock, Paisley, Coatbridge, Motherwell, Dumbarton, Airdrie, and Rothesay.

Of these, at Airdrie, Coatbridge, and Motherwell, the gas plants are owned by private companies. At all the other places named the municipal corporation owns and operates the gas works. I have not tried to get minute information from all the cities and towns of the district, deeming that detailed information from so large a number would make my report very long and in no way enhance its value, as it will be seen the population of the several cities given makes them fairly representative of the whole.

In addition to the questions asked in your circular letter of inquiry, when addressing municipal corporations, I made the further inquiry, question 12, "Whether the gas plant afforded a profit over and above operating expenses and interest on investment, and, if so, how applied?" When writing to private companies I asked "Whether the investment afforded a reasonable profit over operating expenses?" It will be noted that the answers are of the most satisfactory character.

GLASGOW.

Glasgow is, by far, the largest city in the district, and by many regarded as a model municipality. She not only owns and operates her own gas and water works, but bathhouses, tenement houses, lodging houses, art galleries, etc. The city, by act of Parliament, acquired possession of the private gas plants in 1869, so that the question of successful operation of same is no longer an experiment. In the matter of gas supply she not only controls for the city proper but for the contiguous burghs or outlying suburbs of the city (really one city, however, because solidly built up all the way out).

A careful inquiry into the operation and management from the start in 1869 to the present indicates economical, safe, satisfactory, and in

every way most efficient management. I can personally attest to the satisfactory quality of the gas and the satisfaction of the people as to management. The works are in good order, much more valuable than when acquired, and nearly or quite £700,000 of indebtedness has been paid off. In fact, the capital in the works is now so small that profits are sometimes applied to other municipal uses.

The price of gas has been steadily reduced to consumers, commencing in 1869 at $1.11, and now furnished at 60 cents per 1,000 cubic feet.

Leakage, or unaccounted-for gas, in 1869 was 20.8 per cent. It is now less than 10 per cent.

The illuminating power has varied from 23 candles lowest to 28 candles highest. The former figure is regarded as sufficient and is the candle power now furnished.

The use of gas stoves for cooking purposes was not commenced until 1885 and shows, as the figures indicate, a very rapid growth. Mr. Nicol, the city chamberlain, in one of his reports closes a reference to their use in the following words:

> I understand the new enterprise (furnishing gas stoves) has taxed the department to keep pace with the demand, so rapidly has it sprung into favor. For summer cooking in particular, when fires are not wanted for heating, the gas stove proves a most perfect economist of fuel and labor, and it creates no dust.

As shown by the figures below, there are now more than 12,000 (perhaps 16,000 or 20,000) in use.

Herewith are all the figures in detail, as courteously furnished by Mr. Foulis, the efficient engineer of the gas department for the city:

1. Name, location, and population of city: Glasgow and suburbs; population 762,100.
2. Name of company: Glasgow Corporation.
3. Amount invested: £676,035.
4. Process of manufacture: Coal gas.
5. Candle power of gas: 23 candles.
6. Approximate annual output: 2,905,796,000 cubic feet.
7. Number of consumers: 130,623.
8. Price of gas per 1,000 cubic feet: 2*s.* 6*d.*
9. The use of gas stoves for heating and cooking: Commenced to hire and sell stoves for heating and cooking four years ago, and in that period have sold 6,651 and have 5,498 on hire; besides which there are a large number of stoves in use which have been purchased from ironmongers, etc.
10. Wages and hours of labor: Gas stokers work eight hours per day, and are paid 5*s.* per shift.
11. Material used in manufacture: Principally obtained from Lanarkshire and Ayrshire, from 7 to 50 miles from works; costs from 7*s.* to 20*s.* per ton, average 9*s.* 4*d.*
12. Works have afforded large profits, as before intimated.

GREENOCK.

Greenock is the next largest and most important city in the district, with an estimated population of 70,000. In the case of Greenock I asked particularly for statement as to profits and how applied. The reply of Mr. Chalmers, manager of the works, found below, is full and complete. The Greenock works are also owned by the city. I herewith subjoin detailed report.

1. Name, location, and population of city: Greenock; 69,229, census, 1881.

2. Name of company: Corporation property.

3. Amount invested: Works erected in 1829, but removed, and re-erected in present site 1873, hence the capital figure may be somewhat higher in comparison with other towns under different circumstances. This capital is redeemable under act of Parliament by a sinking fund 1 per cent first five years, 1½ per cent next five, and 2 per cent thereafter.

4. Process of manufacture: By coal distillation, two-thirds cannel coal and one-third splint coal. Fire-clay retorts with regenerative furnaces, condensing, scrubbing, purification by lime and oxide of iron.

5. Candle power of gas: Average last year—daily observation—26.45 candles.

6. Approximate annual output, 200,000,000 cubic feet.

7. Number of consumers, about 11,000.

8. Price of gas per 1,000 cubic feet, 3*s.* 4*d.* net to all consumers.

9. The use of gas stoves for heating and cooking: Heating and cooking stoves let out on hire at 10 per cent per annum on maker's price list. Over 300 in use under this system, but many parties use stoves who have bought them direct from the makers.

10. Wages and hours of labor: Stokers, 5*s.* per shift of twelve hours, 6 a. m. to 6 p. m.; coal breakers, 5*d.* per ton, 6 a. m. to 6 p. m.; laborers, 20*s.* per week of sixty hours; retort setters, joiners, blacksmiths, and other tradesmen, at the rates commonly paid by other employers; meter-repairers, 30*s.* to 35*s.* per week; pipe-fitters, 26*s.* to 29*s.*; all sixty hours.

11. Material used in manufacture: Cannel and splint coal, from Lanarkshire and Ayrshire districts. Average price, 11*s.* per ton of 20 hundredweight.

12. "In answer to your yesterday's favor, I have to state that in fixing the rate to be charged per 1,000 cubic feet to consumers of gas, the gas committee always calculate upon a surplus or profit after providing for all working charges, and interest and sinking fund upon the invested capital. This profit runs from £2,000 to £4,000 per annum, means from 3*d.* to 5*d.* on the price of gas, and is applied by the authorities to the reduction of taxes as charged against the ordinary rate-payer. This practice has obtained since our works were acquired by the corporation, in 1831. The profit from our concern, as applied to taxation, means a reduction of 1*d.* per pound assessed on yearly rent or value for every *£1,000 of surplus* from gas."

PAISLEY.

Paisley is the third largest city in the district, having over 60,000 inhabitants. The works are also owned by the city. Gas stoves as yet but slightly used. It will be noticed for the capital invested the profits are very large, considering the cheapness and high candle power of gas.

1. Name and population of city: Paisley; population, 66,000.
2. Name of gas company: Paisley Gas Corporation.
3. Amount invested: £101,000.
4. Process of manufacture: Ordinary, from cannel and splint coals.
5. Candle power of gas: 27 standard candles, delivered.
6. Approximate annual output: Make 230,000,000 cubic feet; unaccounted for, 9 per cent off.
7. Number of consumers, 13,000.
8. Price of gas per 1,000 cubic feet: All consumers, 2*s.* 10*d.*; public lamps, 2*s.* 6*d.*
9. The use of gas stoves for heating and cooking: One hundred and fifty cooking and several hundreds for heating.
10. Wages and hours of labor: Stokers' wages, 5*s.* per shift of twelve hours; assistants, 4*s.*; laborers, 3*s.* 4*d.* per ten hours.
11. Material used in manufacture: Cannel and splint coals, chiefly from Lanarkshire, distance from 10 to 30 miles; average price at works, 9*s.* 3*d.* per ton.
12. Surplus profits from £5,000 to £8,000 per annum, applied to extension of works or town improvements.

DUMBARTON.

Dumbarton is a town of 16,000 inhabitants situated on the north bank of the Clyde. Questions not fully answered and conveying no information save that given in the statistical report noted above. The gas works are owned by the corporation. The cost to private consumers is 3*s.* 3*d.*; public lamps, 2*s.* 9*d.* The pier and public parks are subsidized from the profits.

ROTHESAY.

Rothesay is a town of 8,000 inhabitants. The gas works are owned by the corporation, which also furnishes gas to Bannatyne, a village near by, of 1,000 population. Strangely enough they place an inhibition upon the publication of their response to questions asked, hence the detail of profits, application of same, etc., is omitted, using only such as is published in the report referred to, with some important additions.

1. Name of city and population: Rothesay, 8,300; Port Bannatyne also supplied; population, 1000.
2. Name of company: Belongs to corporation.
3. Amount invested: There is a debt of about £5,000, and the works are valued at £11,000.

4. Process of manufacture: Ordinary or old style of carbonization of coals, with settings of four retorts, and one furnace to each oven.

5. Candle power of gas: Twenty-seven to twenty-eight standard candles.

6. Approximate annual output: 28,068,200 cubic feet.

7. Number of consumers: Rothesay, 2,000; Port Bannatyne, not known.

8. Price of gas per 1,000 cubic feet: 3*s.* 9*d.* with 5 per cent discount to consumers of £50 and upwards per annum if paid within twenty-one days from rendering of account.

9. The use of gas stoves for heating and cooking: We only hire out cooking stoves, and have about 100 in use. There are probably other 20 belonging to private parties.

10. Wages and hours of labor: 30*s.* per week for firemen, from 6 to 6, or twelve-hour shifts, with a week's holiday, for which they are paid, and also if off unwell get full pay. They get a Sunday off once a month.

11. Material used in manufacture: First, second, and third class cannel coals, with a considerable quantity of splint coal. Coals principally from Lanarkshire, distance about 60 miles. The average price at works for last year was 13*s.* 16*d.* per ton, 20 cwt.

AIRDRIE.

Airdrie is a town of 16,000 inhabitants. Her gas works are owned by a company. The very satisfactory dividends may partly be accounted for on account of the raw material being obtained in the immediate neighborhood.

1. Name of city: Airdrie and suburbs.
2. Name of company: Airdrie Gaslight Company.
3. Amount invested: £14,520.
4. Process of manufacture: Gas coal, the usual process.
5. Candle power of gas: 28 candle gas.
6. Approximate annual output: 32,537,200 cubic feet.
7. Number of consumers: 2,300.
8. Price of gas per 1,000 cubic feet: 3*s.* 4*d.*
9. The use of gas stoves: None used.
10. Wages and hours of labor: From 3*s.* 4*d.* to 4*s.* 9*d.*; twelve hours.
11. Material used in manufacture: Gas coal and shale, obtained in neighborhood.
12. Investment affords a good profit: 11 per cent.

COATBRIDGE.

Coatbridge is a town or city about twice the size of Airdrie, with the gas works owned by a company, and the report in detail shows about the same results as to quantity, price, and profits. Like the other small cities, the gas stove has only been used in a very limited way.

1. Name and population of city: Coatbridge; population, 31,000.
2. Name of company: Coatbridge Gas Company.
3. Amount invested: £44,650.
4. Process of manufacture: Distillation of gas coal and shale in fire-clay retorts.
5. Candle power of gas: 26 standard candles.
6. Approximate annual output: 66,000,000 cubic feet.
7. Number of consumers: 4,000.
8. Price of gas per 1,000 cubic feet: 3*s.* 4*d.* per 1,000 cubic feet.
9. The use of gas stoves: Not many in use.
10. Wages and hours of labor: Stokers 4*s.* 6*d.*, laborers 3*s.* 6*d.* per day of twelve hours.
11. Material used in manufacture: Gas coal and shale, obtained in various places within a radius of 12 miles; price of coal, 6*s.* 4*d.*; shale, 8*s.* 9*d.* per ton.
12. Investment affords a reasonable profit.

MOTHERWELL.

Motherwell is a town of 18,000 inhabitants. Gas works owned by company. The management, price, and profits not differing much from the last two named, but coal is obtained from a greater distance, and slightly higher wages paid for labor.

1. Name and population of city: Motherwell; population, 20,000.
2. Name of company: Motherwell Gas Company.
3. Amount invested: £10,500.
4. Process of manufacture: The ordinary clay retorts.
5. Candle power of gas: 28.
6. Approximate annual output: 23,000,000 cubic feet.
7. Number of consumers: 2,100.
8. Price of gas per 1,000 cubic feet: 3*s.* 6*d.* to ordinary consumers, 3*s.* 4*d.* per 1,000 cubic feet to burgh commissioners, and 10 per cent discount (3*s.* 6*d.* per 1,000) to large consumers.
9. The use of gas stoves: A limited number.
10. Wages and hours of labor: 4*s.* 8*d.* per day, twelve hours per day.
11. Material used in manufacture: All Scotch cannels, as follows: Haywood cannel, distance 20 miles, price 25*s.* per ton; Moss Side cannel, about 25 miles distant, price 25*s.*; main and splint cannel, 6 miles distant, 14*s.* per ton; shale, 6 miles distant, 12*s.* 3*d.* per ton.
12. Investment affords a reasonable profit; 10 per cent dividend to shareholders.

L. W. BROWN,
Consul.

UNITED STATES CONSULATE,
Glasgow, May 6, 1890.

IRELAND.

DUBLIN DISTRICT.

REPORT BY CONSUL REID.

1. Athlone.
2. Castlebar.
3. Dublin.
4. Dundalk.
5. Ennis.
6. Galway.
7. Longford.
8. Maryboro.
9. Navan.
10. Nenagh.
11. Roscommon.
12. Sligo.
13. Tipperary.
14. Tullamore.
15. Wicklow.

CIRCULAR LETTER SENT TO GAS SUPERINTENDENTS.

CONSULATE OF THE UNITED STATES OF AMERICA,
204 Great Brunswick Street, Dublin, April 5, 1890.

To the superintendent of the gas works at ——— :

DEAR SIR: For the information of persons largely interested in the manufacture and consumption of gas in the United States I am instructed by the Department of State, United States of America, to request that you furnish me with the data regarding the following branches of the gas industry in your city. If, therefore, you will kindly reply to the following questions in the blank space under each, and return this circular, thus completed, to this office, you will confer a favor which the United States Government and myself will greatly appreciate.

I am, sir, your obedient servant,

ALEX. J. REID,
Consul.

The answers to this circular letter are given herewith following, as furnished to the consul by the officials of the several companies:

ATHLONE.

1. Athlone, Westmeath, and Roscommon counties; population, 7,000.
2. Name of gas company: Town Commissioners Gas Works.
4. Process of manufacture: Carbonized in clay retorts, purified by lime.
5. Candle power of gas: 14-candle.
6. Approximate annual output: 5,500,000 cubic feet.
7. Number of consumers: 200.
8. Price of gas per 1,000 cubic feet: 5*s*.
9. Gas stoves for heating and cooking are not in use.
10. Wages: From 13*s*. to 17*s*. 6*d*. per week of sixty hours.
11. Material used in the manufacture: Pelaw Main coal, at 21*s*. per ton; lime at 1*s*. 8*d*. per barrel; tar used occasionally for heating retorts.

JOHN BRADLEY,
Manager.

CASTLEBAR.

1. Castlebar, Mayo County; population, about 3,800.
2. Name of gas company: Castlebar Gas Company, limited.
3. Amount of money invested in the industry, £2,000.
4. Process of manufacture: Usual; that is, carbonized in clay retorts.

5. Candle power of gas: Averaging 15.
6. Approximate annual output: 3,000,000 cubic feet.
7. Number of consumers: 118.
8. Price of gas per 1,000 feet: 6*s.* 8*d.*
9. Gas stoves are used for heating and cooking very occasionally.
10. Wages: Stokers, 16*s.* per week of sixty hours.
11. Material used: Coal; north of England; 23*s.* 16*d.* per ton.

DUBLIN.

1. City of Dublin and surrounding townships; population, about 376,000.
2. Name of gas company: Alliance and Dublin Consumers' Gas Company.
3. Amount of money invested in the industry: £949,900.
4. Process of manufacture: Manufacture of gas from coal and cannel, and working up residual products; hand labor employed in manufacture; six-hour charges; clay retorts.
5. Candle power of gas: 16-candle gas, tested with flat-flame burner.
6. Approximate annual output: 1,208,000,000 cubic feet.
7. Number of consumers: About 17,000.
8. Price of gas: 3*s.* 7*d.* per 1,000 cubic feet.
9. Gas stoves are used for heating and cooking.
10. Wages: From 18*s.* to 35*s.* a week of forty-eight hours.
11. Material used: Coal and cannel from Newcastle-on-Tyne and Scotland; price varies from 13*s.* to 42*s.* per ton.

W. F. COTTON,
Secretary and Manager.

DUNDALK.

1. Dundalk, Louth County; population in 1881, nearly 12,000.
2. Name of gas company: Dundalk Gas Company.
3. Amount of money invested in the industry: Nominal capital, £30,000; paid up, £22,000.
4. Process of manufacture: Ordinary carbonization of coal in earth retorts; purification by lime.
5. Candle power of gas: Standard of special act, 15 candles; supplied, 16½ to 17½.
6. Approximate annual output: 25,000,000 cubic feet; sales and waste, 23,000,000 cubic feet.
7. Number of consumers: About 600.
8. Price of gas per 1,000 cubic feet: 4*s.* 7*d.* and 4*s.* 2*d.*
9. Gas stoves are used for heating and cooking to a small extent.
10 Wages of employés: 15*s.* to 22*s.* weekly, twelve-hour shifts, including meals.
11. Material used: Arley gas coal, Lancashire; last year, say 16*s.*

JOSEPH A. FOULLIR,
Secretary.

ENNIS.

1. Ennis, Clare County; population, 6,000.
2. Name of gas company: Ennis Gas Consumers' Company, limited.
3. Amount of money invested in the industry: £25,000.
4. Process of manufacture: Coal carbonized in fireclay retort and gas purified by lime.
5. Candle power of gas: 17 candles.
6. Approximate annual output: 4,000,000 cubic feet.
7. Number of consumers: 170.
8. Price of gas per 1,000 cubic feet: 7*s.* 6*d.* per 1,000 cubic feet.
9. Gas stoves are not used.

10. Wages: 12*s.* to 30*s.* per week of sixty hours.

11. Material used: Coals from Fletcher Burrows & Co., Liverpool; cost 25*s.* per ton at works.

GALWAY.

1. Galway (west of Ireland); population 15,000.

2. Name of gas company: The Galway Gas-Light Company, limited.

3. Amount of money invested in the industry: £8,640.

4. Process of manufacture: Coal gas carbonized in clay retorts, purified by lime prepared on the Forestall or American principle; yield from coal 4¼ feet per pound; cost of rock lime, 1*s.* 4*d.* per 3 bushels.

5. Candle power of gas: 16.

6. Approximate annual output: 17,000,000 cubic feet.

7. Number of consumers: 200.

8. Price of gas per 1,000 cubic feet: 4*s.* 9*d.*

9. Gas stoves are used for heating and cooking.

10. Wages of employés and hours of labor: Stokers, 16*s.*; yard and other laborers, 14*s.*; ten hours.

11. Material used: Newcastle coal (Newcastle, England), 21*s.* per ton of 2,240 pounds.

LONGFORD.

1. Longford, Longford County; population, 4,380.

2. Name of gas company: Longford Gas Company, limited.

3. Amount of money invested in the industry: £3,363.

4. Process of manufacture: From coal carbonized in the usual way.

5. Candle power of gas: 18 candles, average.

6. Approximate annual output: 3,763,000 cubic feet.

7. Number of consumers: 180.

8. Price of gas per 1,000 cubic feet: 6*s.* 3*d.*

9. Gas stoves are used for heating and cooking.

10. Wages: 15*s.** per week of sixty hours.

11. Material used: Newcastle coal; price at present, 25*s.* per ton.

MARYBORO.

1. Maryboro, Queen's County; population 3,000.

2. Name of gas company: Maryboro Gas Company

3. Amount of money invested in the industry: £2.650.

4. Process of manufacture: One five-bed bench of retorts, one three-bed, and one two-bed bench, worked alternately; scrubber; two lime purifiers.

6. Approximate annual output: 2,000,000 cubic feet paid for; 250,000 cubic feet lost in waste, etc.

7. Number of consumers: 100.

8. Price of gas per 1,000 cubic feet: 6*s.* 8*d.*

9. Gas stoves are not used for heating or cooking.

10. Wages: A manager, who provides labor, is paid £11 per month.

11. Material used: Generally long spike Arley or Onell coal, Scowcroft & Co., 10 Castle street, Liverpool; Muzum Brothers, 201 Brunswick street, Dublin; Dublin Steamshipping Company, O'Connell street, Dublin; 24*s.* per ton delivered into works; last year 1*s.* less.

GEORGE VANSTON,
Secretary.

* This no doubt means the wages per week for each employé.—A. J. R.

NAVAN.

1. Navan, Meath County, Ireland; population, 3,873.
2. Name of gas company: Navan Gas Company, Limited.
3. Amount of money invested in the industry, £4,000.
4. Process of manufacture: Carbonization with clay retorts, condensers; scrubble and lime purification.
5. Candle power of gas, 16.
6. Approximate annual output, 4,000,000 cubic feet.
7. Number of consumers, 150.
8. Price of gas per 1,000 cubic feet, 6*s.* 3*d.*
9. Gas stoves are not used for heating and cooking.
10. Wages: From 16*s.* to 30*s.* per week of seventy-two hours.
11. Material used: Coal and lime; coal from Arley mines in Lancashire, England; lime from local kilns.

NENAGH.

1. Nenagh, Tipperary County; population, 6,000.
2. Name of gas company: Nenagh Gas Consumers' Company.
3. Amount of money invested in the industry: £3,645.
4. Process: Ordinary process of gas manufacture.
5. Candle power of gas, 17.
6. Approximate annual output, 3,000,000 cubic feet.
7. Number of consumers, 135.
8. Price of gas per 1,000 cubic feet, 6*s.* 8*d.*
9. Gas stoves are not used for heating and cooking.
11. Material used: Oxide of iron, Mountrath, Ireland; 25*s.* per ton.

ROSCOMMON.

1. Roscommon, Roscommon County; population, 2,200.
2. Name of gas company: Roscommon Gas Company, Limited.
3. Amount of money invested in the industry, £2,500.
4. Process of manufacture: Settings of clay retorts heated with the coke furnace.
5. Candle power of gas, 18.
6. Approximate annual output, 1,750,000 cubic feet.
7. Number of consumers, 82.
8. Price of gas per 1,000 cubic feet, 7*s.* 6*d.*
9. Gas stoves are not used for heating and cooking.
10. Wages, 15*s.* per week; seventeen hours per day.
11. Material used: Coal, obtained by contract, 24*s.* per ton.

SLIGO.

1. Sligo, Sligo County; population, 10,808.
2. Name of gas company: Sligo Gaslight and Coke Company.
3. Amount of money invested in the industry: Share capital, £9,000; loan capital, £2,000.
4. Process of manufacture: Coal gas. Coal carbonized in retorts heated by generator furnace; gas condensed, washed, and purified with lime and oxide of iron.
5. Candle power of gas, 16.
6. Approximate annual output, 500,000 cubic feet.
7. Number of consumers, 360.
8. Price of gas per 1,000 cubic feet, 5*s.* 5*d.*; cooking, heating, and motive power 33⅓ discount; public lighting, 5*s.*, including hire of lamps complete.

9. Gas stoves are used for heating and cooking and let on hire by company.
10. Wages, 2*s.* 6*d.* to 2*s.* 10*d.* per day; ten hours, yard men; firemen, twelve hours.
11. Material used, coal. Bituminous Scotch coal, Meikelhill gas coal, Scotland, Glasgow. Cost 17*s.* per ton, average.

C. B. TULLY,
Secretary and Manager.

TIPPERARY.

1. Tipperary, population not given.
2. Name of your gas company: The Tipperary Gas Company, Limited.
3. Amount of money invested in the industry, £8,600.
4. Process of manufacture: Ordinary mode customary in England.
5. Candle power of gas: 15.
6. Approximate annual output, 6,000,000 cubic feet.
7. Number of consumers, about 250.
8. Price of gas per 1000 cubic feet, 6*s.* 3*d.*
9. A few gas stoves are used for heating and cooking.
10. Wages, from 13*s.* to 30*s.* weekly; twelve hours per diem.
11. Material used, Newcastle coal, 21*s.* per ton. Stourbridge fireclay goods, £3 10*s.* per ton.

R. B. ANDERSON,
35a Great George Street, London, S. W. District.

TULLAMORE.

1. Tullamore (town), population 5,000.
2. Name of gas company: Tullamore Gas Company, Limited.
3. Amount of money invested in the industry, £2,700.
4. Process of manufacture: Orsel coal carbonized in clay retorts; also 10 per cent of cannel in winter.
5. Candle power of gas, 16.
6. Approximate annual output nearly 3,500,000 cubic feet.
7. Number of consumers, 150.
8. Price of gas per 1,000 cubic feet, 6*s.* 8*d.*
9. Only five gas stoves are in use in this town.
10. Wages 16*s.* per week for stokers. Manager, £105 per annum with house, coal, and gaslight; twelve hours day, twelve hours night, each stoker in turn.
11. Material used: Best Orsel coal at £1 per ton at the gas works. Lime used for purifying; coal obtained from England.

WICKLOW.

1. Wicklow Town, population 3,500.
2. Name ofgas company: Wicklow Gas Company, Limited.
3. Amount of money invested in the industry, £3,000.
4. Process of manufacture: Carbonized coals.
5. Candle power of gas, about 14.
7. Number of consumers, 100.
8. Price of gas per 1,000 cubic feet, 5*s.* 10*d.*
9. Gas stoves are not used for heating and cooking.
10. Wages, about £300* per annum; hours of labor, ten hours per day.
11. Material used, coals; obtained in England; about 20*s.* per ton.

The above is a rough estimate; manager being ill can not supply accurate information.

*This sum no doubt means the total expenditure for labor during the year.—A. J. R.

NORTH OF IRELAND.

REPORT BY CONSUL RUBY, OF BELFAST.

In response to circular of February 15, 1890, on the subject of gas manufacture, I have the honor to inclose a report covering four of the principal cities and towns in the north of Ireland. The gas furnished here is of a bettter quality than that usually furnished in the United States. This is due in part at least to the superior quality of coal used by the gas manufacturers.

BELFAST.

Name, location, and population: City of Belfast, county of Antrim, province of Ulster, Ireland; population, 232,222.

Name of gas company: Belfast Corporation Gas Department.

Amount of money invested in the industry, $1,957,053.68, on June 30, 1889.

Process of manufacture: Clay retorts, chiefly, in settings of eight. The condensers are of the type known as Korting-Cleland slow speed. They use rotary exhausters of the Beale form, made by Gwynne & Co., of the Strand, London. The purification at present is by lime only, but they are pioneering the claus system of purification, which they expect to make a success.

Candle power, from 17 to 17¾ standard.

Approximate annual output for year ended June 30, 1889, 907,000,000 cubic feet.

Number of consumers, 19,288, on June 30, 1889.

Price of gas, 66 cents per 1,000 cubic feet (meters free), with discounts in proportion to consumption, as follows: On a quarterly consumption of 10,000 cubic feet and not exceeding 50,000 cubic feet, 2½ per cent; above 50,000 and not exceeding 100,000 cubic feet, 5 per cent; above 100,000 and not exceeding 200,000 cubic feet, 10 per cent; above 200,000 and not exceeding 400,000 cubic feet, 15 per cent; above 400,000 cubic feet, 20 per cent:

The uses of gas stoves for heating and cooking: They commenced the hiring out of stoves in January, 1887, and at present have about 4,000 stoves fixed and in use.

Wages of employés and hours of labor: They are at present paying their retort-house workmen for charging retorts (with shovels) $1.60 per shift of twelve hours, and those who draw retorts and wheel out and slake coke $1.46 per shift of twelve hours. The yard laborers receive $3.89 per week, and are reckoned to work about fifty-seven and one-half hours per week.

Material used in the manufacture of gas, where obtained, and price at the gas works: Coal and cannel used in the manufacture of gas are obtained from the Wigan and Ayrshire districts. Coal costs $3.65 per ton in the works, and cannel costs $6.32 per ton.

BALLYMENA.

Name, location, and population: Town of Ballymena, county of Antrim, province of Ulster. Population, 10,000.

Name of gas company: Ballymena and Harryville Gas Company.

Amount of money invested in the industry, $58,398.

Process of manufacture, same as Belfast.

Candle power, 18 candles.

Approximate annual output, 12,000,000 cubic feet.

Number of consumers, 550.

Price of gas per 1,000 cubic feet, $1.31.

The use of gas stoves for heating and cooking are used more every year.

Wages of employés and hours of labor: Average wages, $4.86 per week of sixty-five hours.

Material used in the manufacture of gas, where obtained, and price at gas works: Coal and cannel, all from England, delivered at gas works at $4.74 per ton.

LONDONDERRY.

Name, location, and population: City of Londonderry, county of Londonderry. Population, 35,000.

Name of gas company: Londonderry Gaslight Company.

Amount of money invested in the industry, $207,826.25.

Process of manufacture: The ordinary process of carbonization (of coal only) in fireclay retorts, and usual system of condensation of washing and purification. No oxide of iron is used in purifiers, lime only being the material used in purification.

Candle power: The fixed or parliamentary standard is 16 candles, but the quality supplied in Londonderry is 18 candles.

Approximate annual output, about 57,000,000 cubic feet.

Number of consumers, 1,600 customers and 650 public lamps.

Price of gas per 1,000 cubic feet: The present charge is 93 cents per 1,000 cubic feet, with a discount of 2½ per cent to customers whose annual accounts amount to $194.66 but are under $292, and 5 per cent discount to those whose accounts are over $292.

Gas stoves for heating and cooking are used to a limited extent.

Wages of employés and hours of labor: Wages vary from $3.16 to $5.34 per week, according to the class of labor.

Material used in the manufacture of gas, where obtained, and price at the gas works: Coal and cannel imported from England and Scotland, the price per ton of coal delivered at the works is $3.89, that of cannel $6.32.

LURGAN.

Name, location, and population: Town of Lurgan, county of Armagh, province of Ulster, Ireland. Population, 14,000.

Name of gas company: Lurgan Gaslight and Chemical Company, Limited.

Amount of money invested in the industry: The authorized capital is $97,330. The actual paid up capital is $41,189.05.

Process of manufacture, same as Belfast.

Candle power: The gas made has an almost uniform illuminating power of 18 candles.

Approximate annual output: The gas sold in 1850 was 1,249,000 cubic feet; in 1860, 4,258,720; in 1870, 7,676,750; in 1880, 11,532,000; in 1889, 19,080,300.

Number of consumers, 550 in 1889.

Price of gas per 1,000 cubic feet: In 1850, $2.43; in 1860, $1.82; in 1870, $1.41; in 1880, $1.21; in 1889, 95 cents.

The use of gas stoves for heating and cooking: The use of gas engines has been a source of revenue for several years past, and there is now an increasing disposition to use gas stoves for heating and cooking purposes. The smoothing of linen and cambric handkerchiefs (a large trade here) is done by gas-heated irons.

Wages of employés and hours of labor: The wages vary from $3.40 to $5.83 per week, pipe-layers and stokers getting the highest rate; laborers get $2.92 per week.

Material used in the manufacture of gas, where obtained, and price at the gas works: The coal used is all purchased in England, principally in the Newcastle district, and during 1889, cost $4.13 per ton delivered at the works at Lurgan. Present annual consumption 2,500 tons.

DANIEL G. RUBY,
Consul.

UNITED STATES CONSULATE,
Belfast, May 12, 1890.

SOUTH OF IRELAND.

REPORT BY CONSUL PIATT, OF CORK.

I have found much difficulty in getting sufficient answers to inquiries made by letters addressed to the managers of gas works throughout the consular district. After long delays I have received answers to but seven such letters of inquiry sent out by me, these referring to seven of the larger towns and cities, although there are between fifteen and twenty places within the district where gas is manufactured and consumed, gas being made and used here, as a rule, in all places having a population of 3,000 and upwards. The principal facts and figures comprised in the series of answers received by me are set forth in the following table, which I have compiled from said answers, showing the names of places, with location and population, the names of the gas companies,

the approximate amount of money invested, the approximate annual output, and the number of consumers in each place respectively:

Name and location of place.	Name of company.	Amount of money invested.	Approximate annual output.	Number of consumers.	Population.
			Cubic feet.		
Bandon, Cork	Town Commissioners	$10,700.00	5,500,000	240	5,000
Cork, Cork	Cork Gas Consumers' Company.	832,000.00	180,000,000	4,400	80,000
Killarney, Kerry	Killarney Gas Company, Limited.	36,500.00	4,000,000	185	5,000
Queenstown, Cork	Queenstown Gas Company	97,300.00	15,000,000	400	10,000
Skibbereen, Cork	Skibbereen Gaslight and Coke Company, Limited.	16,500.00	3,450,000	204	4,500
Waterford, Waterford	City of Waterford Gas Company.	204,393.00	32,000,000	950	22,500
Youghal, Cork	Town Commissioners	19,500.00	7,000,000	200	6,000

The process of manufacture is by carbonization of coal in ordinary fire-clay retorts, with pipe condensers, washing and scrubbing with water, and purification with oxide of iron and lime.

The candle power of the gas produced varies from 14 to 17, the parliamentary standard being 14.

The price of gas also varies, ranging from 70 cents to $1.82 per 1,000 cubic feet. At Cork the lowest figure is 70 cents, being for gas used in gas engines, while gas supplied there for cooking stoves is 81 cents; for corporation use, 87 cents; for consumers outside the district, *i. e.*, in the suburbs, $1.03, while the general rate in the city is 91 cents. In the smaller towns mentioned the rate is usually $1.21, while at Killarney the highest rate, $1.82, is charged.

Comparatively few gas stoves are here used—these principally at Cork, Queenstown, and Waterford—for cooking and heating purposes. But there appears to be a growing tendency to their introduction and use for these purposes. The rate of wages of employés at gas works varies according to the class of workmen and the place in which they are employed. At Cork, I am informed, stokers receive about $8.50 per week, working 12 hours per day (12 hour shifts). At Queenstown the same class of workmen receive $5.85 per week, also for 12 hours' service per day. At Waterford stokers receive $6.33 per week, working 12 hours per day. At smaller places the rate of wages is less, ranging from $3.16 to $4.87 per week.

The coal used for making gas is imported, as already stated above, from various collieries in England, principally New Castle, and costs from $4.25 to 6.08 per ton. The lower rates are for places like Cork and Queenstown, where it is imported by the gas companies themselves and delivered to them directly from the vessels bringing it; the higher rates are for places inland, which involve additional transportation by railway.

JOHN J. PIATT,
Consul.

UNITED STATES CONSULATE,
Cork, November 30, 1890.

GIBRALTAR.

REPORT BY CONSUL SPRAGUE.

The introduction of gas into Gibraltar dates from the year 1857. The gasometer is located at the southern part of the rock, on government property, held on a lease granted for that special purpose.

The population of Gibraltar may be estimated at about 24,000 souls, including the garrison.

The company furnishing the gas is styled the Gibraltar Gas Company.

The nominal capital is $100,000.

The process of manufacturing the gas is the same as generally conducted in English towns.

The candle power of the gas is equal to 16.7.

The annual output is equal to about 40,000,000 cubic feet.

The number of consumers is about 700, half the consumption being with the government departments and barracks.

The present ruling price for the gas furnished and consumed here is $1.50 per 1,000 cubic feet to private parties, and $1.35 to the government departments and barracks.

Gas stoves are hardly ever in use here, charcoal being generally used for cooking and heating purposes, being more economical.

The hours of labor are from 6 a. m. to 6 p. m., with a short interval for meals, and the wages are equal to $4 per week.

The coal used for the manufacture of gas comes from England, and it costs the company about 26*s.* per ton placed at the gas works.

HORATIO I. SPRAGUE,
Consul.

UNITED STATES CONSULATE,
Gibraltar, April 9, 1890.

MALTA.

REPORT BY CONSUL WORTHINGTON.

It is impossible to obtain particular answers to the various inquiries propounded in Department circular, but such information as I have been able to gather on the subject I have the honor to herein inclose.

Inclosure No. 1 is the general manager's letter in which was inclosed a copy of the last annual report of the Malta and Mediterranean Gas Company, Limited, and which is of no account in connection with the report required by the Department.

Inclosure No. 2 is a paper giving such answers to the questions enumerated in the circular of February 15, 1890, as could be obtained and which cover most of the items of information desired.

I may add that the gas furnished consumers in Malta varies very much in brilliancy, one week's supply being good and steady and the next week's poor and fluttering. On the whole, though, I hear of but few complaints from consumers.

JOHN WORTHINGTON,
Consul.

UNITED STATES CONSULATE,
Malta, June 25, 1890.

[Inclosure No. 1.]

Mr. Starkey to Vice-Consul Eynaud.

THE MALTA AND MEDITERRANEAN GAS COMPANY, LIMITED,
GAS OFFICE, VALETTA,
Malta, June 2, 1890.

C. BREED EYNAUD, Esq.,
United States Vice-Consul, Acting Consul, Malta:

SIR: In reply to your letter of 31st ultimo, I inclose copy of the last annual report of the directors of this company, which will give you some of the information desired.

Besides Malta this company supplies gas to Corfu, as well as to Trapani and Marsala.

Regarding many of the inquiries contained in your letter, I beg to refer you to our London office, 60 Gracechurch street, where alone the information is obtainable.

Yours truly,

JOHN W. STARKEY,
General Manager.

[Inclosure 2 in Consul Worthington's report.]

PRIVATE INFORMATION OBTAINED.

Names, locations, and populations of cities using gas: Valetta (the capital), Floriana (a suburb or Valetta), Cospecua, Senglea, and Vittariosa, located in the Island of Malta.

Populations: Valetta, 24,351; Floriana, 7,135; Cospicua, 11,218; Senglea, 7,413; and Vittariosa, 6,171.

The name of gas company is The Malta and Mediterranean Gas Company, Limited, of London, E. C.

This company has other stations in the Mediterranean. The amount of money invested in the industry is about £80,000 for the two stations at Malta. Process of manufacture not known. Candle power of gas is on an average 14 per street lamp. Approximate annual output, 41,028,000 cubic feet (in 1883).

Number of consumers: The largest consumer is the Government, which takes yearly about 27,832,000 cubic feet. The rest goes to private consumers.

The price of gas per 1,000 cubic feet is 4*s.* 6*d.*

The use of gas stoves for heating and cooking is very limited and only used for boiling water at odd times.

Wages of employés and hours of labor not known.

The material used is coal, sulphur compounds, etc., obtained from England.

No information can be obtained from the gas company.

SPECIAL CONSULAR REPORTS.

INDIA RUBBER.

REPORT FROM THE CONSULS OF THE UNITED STATES, IN ANSWER TO A CIRCULAR FROM THE DEPARTMENT OF STATE.

ARRANGEMENT.

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WASHINGTON:
GOVERNMENT PRINTING OFFICE.
1892.

PART I.

THE RUBBER TREE.

SPECIAL CONSULAR REPORTS

ON

INDIA RUBBER AND MANUFACTURES OF, ETC.

I. THE RUBBER TREE.

CONTINENT OF AMERICA.

MEXICO.

REPORT BY CONSUL-GENERAL GUENTHER, OF MEXICO CITY.

MEXICAN DUTIES ON RUBBER.

The duties per kilogram, Mexican currency, are as follows, taken from the Mexican "Arancel de Aduanas:"

Rubber in strips	$0.10
Boots and shoes, all sizes and shapes	.48
Rubber clothing	1.60
Rubber prepared for the use of dentists	2.00

Caoutchouc, or India rubber, is produced to some extent in the States of Michiocan and Colima, in this consular district, and is in Mexico, a product of a species of tree called "Hule," also called "Algualguitl," which trees belong to the family of "Euphorbiaceæ," comprising more than five hundred different varieties.

India rubber, up to the present time, is extracted in Mexico by the Indian in the most primitive and unsystematic fashion. They make an incision in the bark of the trees, from which soon after begins to flow a juice resembling milk. This juice is collected in receptacles made of bark or in earthen vessels, and afterwards the same is boiled down to a proper consistency, in order so as to form balls of gum, which the Indians take to market for sale.

The amount of crude rubber exported from the Republic is as follows, according to the latest statistics published by the Mexican Government, from the year 1887 to 1888:

Germany	$12,632.00
Colombia	1,757.00
Spain	525.86
United States	153,004.20
France	426.00
England	1,040.00
Total (Mexican currency)	169,385.06

The question of cultivating the India rubber tree has already been agitated considerably by private parties as well as by the federal authorities of the Republic of Mexico. The supply of India rubber in the accessible regions is considerably diminishing, while the demand for it is steadily on the increase. This is due to the fact that the Indians in order to gain as much of the juice as possible at one time, often strip the forest trees yielding the gum entirely of their bark, or make such frequent incisions that the trees soon die. In fact they are constantly destroying these valuable trees which by rational treatment would yield right along. Practical experiments with the cultivation of these trees have been made in Mexico by various intelligent persons in different parts of the country, notably in the district of Soconusco, State of Chiapas, and in the State of Vera Cruz. These experiments, according to the testimony of the Mexican officials in charge of the Bureau of Agriculture, have demonstrated beyond doubt that this industry can be established with entire safety as to warranting excellent results. There is one case authenticated in Soconusco where three young forest trees were transplanted which now have yielded for more than thirty-five years. The diameter of the trunks of said trees are now about 7 feet, and the diameter of the branches at their greatest expanse is more than 80 feet. Each of these trees yields annually more than 50 pounds of gum. It has been established that the most favorable time for extracting the juice is in the rainy season, as then the yield is greater, and tapping the trees then is not so hurtful as in the dry season.

To gain an idea of the profitableness of the culture of rubber-yielding trees, the following conservative estimate may prove valuable. It is made upon a basis of 10,000 trees, planted about 23 feet apart (a distance of 15 feet between the trees is considered the minimum):

Cost of 160 acres of land, 40 cents per acre	$64.00
Clearing and breaking the ground, at $4.50 per acre	720.00
Planting the trees, at $2.25 per acre	360.00
Cultivating the soil five times in six years, at $3.50 per acre	1,750.00
	2,894.00

In the sixth year these trees yield 6 pounds of milk each, or for the 10,000 trees 60,000 pounds of juice. The maximum of water contained in this juice is 56 per cent, so that the rubber obtained would be—

26,400 pounds, at 30 cents per pound		$7,920.00
Labor for collection and evaporation, at 3 cents per pound	$792.00	
Total expense up to date, six years after purchase	2,894.00	
		3,686.00
Leaving a net profit at the end of the sixth year of		4,234.00

The profit of the seventh year would be at least $7,920 less $792, or $7,128.

Of course, owing to the constantly increasing yield of the trees as they grow larger, this profit will be increasing for a number of years.

It will be readily seen that the cultivation of these trees offers splendid inducements. The question of supplying the necessary labor is hardly to be taken in consideration, as the trees require little if any attention. The medium temperature of the region in which these trees prosper best is above 87° F. during the hot season. The plants can either be raised from the seed in nurseries and afterwards transplanted, or young trees be transplanted taken from the forests. It is stated that the culture of these gum trees can profitably be combined with the raising of cotton, experiments having demonstrated cotton will do admirably under the same climatic conditions that are favorable to gum trees. These trees are found in greater or lesser abundance in the whole coast region of Mexico, on the Gulf coast, and on the Pacific.

I have not been able to learn whether American capital is employed in rubber gathering or trading in my district, but I believe there is not.

Regarding the manufacture of rubber in my district, rubber is not manufactured into any articles of commerce, nor do I believe that it is in any part of the Republic. The exact amount of the importation of manufactures of rubber in this district can not be given, but the United States imported during the year 1888 into Mexico, of rubber goods, 3,146 pairs of boots and shoes; as far as the imports from other countries are concerned, I could not learn that. Crude rubber is exported from this country free of duties, but duties are imposed upon foreign manufactured rubber imported into this country.

American rubber goods are regarded equal to those imported by any other country, and the suggestions that I would offer to American manufacturers of rubber desirous of extending their trade in this country are that they send men to this country who are thoroughly conversant with the language and customs of the country, who are polite and in every respect good business men, and let them solicit trade in Mexico in the same business-like manner they would adopt in the United States in order to sell their goods.

RICHARD GUENTHER,
Consul-General.

UNITED STATES CONSULATE-GENERAL.
Mexico City, October 24, 1890.

CERRO DE PASCO.

REPORT BY CONSULAR AGENT McNULTY.

1. Caoutchouc is not a product of this district, but it is found some 45 leagues northeast from this city in the Chuchurra and Palcazú regions on the extremes of the departments of Loreto and Iunin.

2. The yield is from trees which are found at about 1,500 feet above sea level. I do not know the botanical names, but there are two species of the tree, called, in the aboriginal language, one "santonja," and the other "zarenga."

3. The method of conducting the business of rubber gathering is certainly very rude and destructive; they cut down the trees and then cut gutters in the bark and allow the crude rubber to ooze out into holes in the ground, instead of tapping the trees, as we do the maple tree to abstract the juice for sugar-making, which can be done. Whole tracts of caoutchouc forests are laid waste in this way and no attention paid to the preservation of the tree. The gathering is mostly done by Brazilian Portuguese, who owe no responsibility to any person, because the territory does not belong to Brazil, but to the Republic of Peru.

4. I am not aware that any American capital is employed in the business except, indeed, that there are some American purchasers of the crude rubber at the city of Pará, which is the principal port for exportation of the article.

5. I do not know the amount of crude rubber exported.

6. I understand that there is a heavy export duty on the crude rubber, but do not know the amount.

7. There are fears expressed of the failure of the natural supply of rubber, unless some steps are not taken to prevent the wholesale devastation going on.

8. I am not aware that any experiments have been made in the cultivation of the trees, but I am assured that they can be cultivated and that they also produce saplings from the stumps after the trunks are cut down; but as they belong to a low, wet, and swampy region of the torrid zone, it is supposed they could not be cultivated to any advantage outside of a similar region.

Under this heading I will say that there are no manufactures of rubber in this district; the place is so peculiarly situated on the highest ridge of the Cordillera, nearly 15,000 feet above sea level, and forms an equal divide between the Pacific and the Atlantic oceans, that we see no rubber here except the manufactured article that comes in the shape of clothing through the port of Callao.

The American manufacture is considered the best.

M. C. McNULTY,
Consular Agent.

UNITED STATES CONSULAR AGENCY,
Cerro de Pasco, May 25, 1891.

FRONTERA.

REPORT BY CONSULAR AGENT HOFF.

CAOUTCHOUC AND CRUDE RUBBER.

1. Caoutchouc or India rubber is a product of my district.

2. It is yielded by trees, and not by vines.

3. Rubber gathering is very tedious and slow work. Indians, after making an incision in the bark of a tree, use a cup (jicara) to gather the milk-white juice, and when said cup is full they empty its contents into a can and replace the cup under the incision, and continue this operation as long as the tree gives any juice.

4. There is no American capital in rubber gathering or rubber trading in my district.

5. In the quarter ended September 30, last, an amount of $578.62 worth of rubber has been shipped to New York from this State, and I am confident that ten times as much could have been shipped were it worked on a larger scale, and were the gatherers better paid. Said article passes through the hands of too many middlemen, and the Indians who work so much to gather it do not get the value of their work, and therefore do not trouble or devote themselves much to rubber gathering. By cultivating corn around their houses they suffer less hardships and get better pay.

6. There is no export duty on crude rubber.

7. There is no fear expressed of the failure or early decrease of the natural supply of rubber; there are thousands of trees in this State.

8. I know of two experiments in the cultivation of rubber trees, one by Mr. Antonino Buhres, of San Juan Bautista, and the other by Mr. Louis Martin, of Montecristo.

9. Both of these experiments have proved a failure; it is supposed that it was for the want of proper care.

10. Rubber is susceptible of cultivation, and its cultivation would undoubtedly be profitable, but manufacturers of the United States must unite and try to get all they can out of this district and pay the gatherers the full value of their work, only deducting therefrom the shipping expenses, freights, and small commission of the purchaser.

MANUFACTURES.

11. Nothing is manufactured out of India rubber in my district.

12. As nothing is manufactured, nothing is exported to other countries.

13. There are no representative manufacturers.

14. No crude rubber is imported in my district, and if any was imported the duty would be 10 cents per kilo.

15. All the manufactured rubber goods sold in my district are imported from the United States.

16. The value of the rubber goods imported from the United States in the shape of clothing, boots, and shoes only amount to about $2,000 a year.

18. American rubber goods are well regarded in comparison with those of other countries.

19. As I have said above, manufacturers must unite and pay the gatherers the full value of their hard work and do away with all middlemen. This is the only way to extract a large quantity of crude rubber from this district.

MICHAEL GIRARD,
Consular Agent.

UNITED STATES CONSULAR AGENCY,
Frontera, November 7, 1890.

SAN BENITO.

REPORT BY CONSULAR AGENT QUINBY.

RUBBER GATHERING.

India rubber is one of the natural products of the coast section of this department, and is extracted from trees which are found growing on the low lands, and which sometimes reach a height of 80 feet and a diameter of 2½ to 3 feet, the botanical name of which I do not know.

The method of extracting the sap is of a most destructive nature, the almost universal custom being to fell the trees, and the bark being slit at short distances the full length of the tree the sap is gathered in vessels or large leaves placed below to receive it. It is then placed in the sun to dry, and this process completed it is ready for market.

There are no Americans engaged in gathering or buying rubber in this section, and so little remains that no person of capital would be warranted in making it a special business.

The exports are steadily decreasing from year to year and last year only about 60 hundredweight were sent from here to the United States as against 116 hundredweight for 1888 and 256 for 1887. This falling off is owing, no doubt, to some extent, to the low prices which ruled last year. The rubber from here is nearly all sent to New York, only a small quantity being sent to Europe.

There is no export duty.

RUBBER CULTIVATION.

As I have intimated above, the natural supply of rubber has been almost exhausted by the destructive method employed in extracting the sap, but all experiments so far made in the cultivation of the tree have proved successful. It is a hardy, quick-growing tree, but does not reach a size large enough to be tapped (as it should be) for from ten to

twelve years, and the variety is said to be of inferior quality (whether or not its inferiority is owing to the methods employed, I do not know). Successful experiments are reported to have been made with "Para" rubber further south in Central America, and if the report is true, I have no doubt that it can be grown here as well, the climate and conditions being similar. The only plantation of importance in this vicinity of cultivated rubber is of about 25 acres, the trees being now about 5 years old, looking well, and give promise of becoming very profitable to the owner within a few years.

There are no manufactures of India rubber in this department.

IMPORTS OF RUBBER GOODS.

Rubber goods are imported mostly from the United States, but the figures are not at hand to show the exact amount of imports.

The duties on all imported rubber goods are heavy.

So far as I can learn, rubber goods from the United States are equal to any, except perhaps the higher grades of waterproof coats or coverings for horseback riding.

A class of goods are needed here that will withstand heat as well as water. The rainy season is also the warmest season, and common grades do not last more than two or three months, the heat affecting them more than the water. It is necessary also that they be *waterproof*, for in this climate it frequently happens that as much as 2 or 3 inches of water falls in a storm of as many hours, and in such storms ordinary light rubber coats are useless. The kind of covering most in demand is the "manga," a large rectangular piece of waterproof cloth with a hole in its center to pass the head through, and is used in horseback riding. It should be long enough to reach to the feet, and thus completely cover the rider. Rubber boots are never used, and rubber overshoes are seldom seen, though they might find sale if once introduced.

F. A. QUINBY,
Consular Agent.

UNITED STATES CONSULAR AGENCY,
San Benito, November 11, 1890.

TUXPAN.

REPORT BY CONSUL DRAYTON.

CRUDE RUBBER.

Caoutchouc or India rubber is a product of this district. It is yielded by trees, native name being hule, botanical Siphoria Cahuchu.

A spiral channel is cut around the tree from top to bottom from the right, an exact cut is made around to the left so that both cross each

other, making a drainage to the bottom. The milk is placed in an earthenware vessel and whipped with a weed called coyuntla, which is an astringent and causes the milk to curdle, making the crude rubber.

No capital is employed in rubber gathering, as the natives bring same to the merchants as there are not any rubber farms in this district, the trees being scattered all over this section of the country. There are two American houses in this city that buy rubber, but all dealers buy and ship to New York.

The amount of crude rubber exported from the district in the past two and a half years was 93,181 pounds, with a value of $55,908. The entire product went to New York. There is no export duty on rubber.

Fears are expressed of the failure or early decrease of the natural supply of rubber, and steps are being taken to protect the trees.

Experiments have been made in the cultivation of rubber trees, plants, or vines, but not to any great extent.

On the coast rubber has proved a failure, while in the interior on upper lands it is a success.

The rubber tree is susceptible of cultivation and its culture would be profitable, but unfortunately the natives have not patience to wait eight or ten years until the trees commence to yield.

MANUFACTURED RUBBER.

There are no rubber goods manufactured in the district. There are no importations except manufactured rubber.

Rubber boots, shoes, coats, and toys are imported from the United States; value unknown.

A very heavy duty is imposed upon imported rubber goods. American rubber goods compared with those of other countries are equal to any, if not superior.

I would suggest, for the benefit of American rubber manufacturers desirous of extending their trade into this district, the forwarding an agent conversant with the Spanish language and bringing a full set of samples.

JOHN DRAYTON,
Consul.

UNITED STATES CONSULATE,
Tuxpan, October 25, 1890.

YUCATAN.

REPORT BY CONSUL THOMPSON, OF MERIDA.

I have completed my investigation upon the rubber tree and its growth in Yucutan.

The result is not especially encouraging to those who expect to develop the rubber industry within this district.

The trees grow over a large extent of territory, but they grow sparsely and the soil generally is not conducive to their establishment on a scale commercially profitable of large plantations planted and cared for as elsewhere.

EDWARD A. THOMPSON,
Consul.

CONSULATE OF THE UNITED STATES,
Merida, April 19, 1891.

CENTRAL AMERICA.

COSTA RICA.

REPORT BY CONSUL MACKEY, OF SAN JOSÉ.

The India rubber of Costa Rica is extracted from the *Castilloa elastica*, which is found on the coasts of the country. The supply of rubber in the easily accessible regions is almost exhausted, but is said to abound in the mountains.

I can not describe the method of gathering the rubber, for San José is not situated in the rubber districts, and no one here can give me information in regard to this industry.

It is certain, however, that the methods used have been so improvident and destructive as to almost extinguish the sources of supply in those regions which formerly produced the greatest quantity of this valuable article of commerce.

The Government has made earnest efforts to stay this improvident waste and to repair the losses already incurred by inflicting a penalty upon those who destroy the rubber trees and granting rewards to those who cultivate them.

The laws on the subject were too long delayed or too imperfectly executed to prove effectually preventive of the destruction of the supply, but they have resulted in the planting of trees in various parts of the Republic. It is undoubted that rubber is susceptible of cultivation, and that its culture will be attended with profit; but the plantations of Costa Rica are very limited and too recent to have produced as yet convincing results.

The amount of crude rubber exported in 1889 was valued at $6,317, being but little more than one-half the amount exported during the preceding year.

There is an export duty of one-third of a cent per kilogram on rubber in Costa Rica.

No American capital is employed here either in rubber-gathering or rubber-trading.

All Costa Rican rubber is exported to the United States.

No rubber is manufactured in Costa Rica, and rubber goods are imported and used to a very limited extent.

The duty on manufactured rubber is as follows: Rubber coats or clothing, 54 cents per kilogram; hose, 9 cents per kilogram; boots and shoes, 65 cents per kilogram; toys, 25 cents per kilogram. The duty

on crude rubber is 2 cents per kilogram, but none is imported. The value of rubber goods imported in 1889 was only $4,186, Costa Rican currency.

Almost all manufactured rubber is imported from the United States.

BECKFORD MACKEY,
Consul.

CONSULATE OF THE UNITED STATES,
San José, November 1, 1890.

GUATEMALA.

REPORT BY CONSUL-GENERAL KIMBERLY.

The rubber produced in this country is bled from a tree indigenous to the coast or hot climates of Central America. It is a different-looking tree from the rubber-producing tree of Brazil. It grows more rapidly, and has a tendency to grow taller and straighter. These trees have been found growing in great numbers, scattered through the tropical forests of Central America, especially in Nicaragua and Mosquito coast, but owing to the destructive manner which has been employed to obtain their valuable gum they are rapidly disappearing.

There have been various attempts made by the Guatemalan Government to prevent the destruction of these trees and to encourage the planting of more. The trees are easily planted, need no cultivation, and grow rapidly from the seed. Hitherto most people have been discouraged from planting rubber trees, owing, principally, to the length of time needed for a tree to become sufficiently large to produce a profitable yield of gum, but the few who have undertaken this investment can now look forward to the time, not so far distant, when their few thousand rubber trees may bring them a fortune little dreamed of.

To plant the tree the first thing required is the seed (a small, round, dark seed), which may be sown in drills, and, after obtaining sufficient size, transplanted. But the simplest and cheapest way to plant rubber on a large scale is, after selecting a suitable tract of wild forest land, simply sow the seeds through the forests.

There still remains in the northern part of Guatemala, in that territory lying between Belize and Tabasco, great tracts of partially explored forests containing great quantities of rubber.

The rubber is obtained from the tree by cutting an incision in the bark, from which flows a fluid called milk, this, after being congealed by some simple process, is ready for market.

SAMUEL KIMBERLY,
Consul-General.

UNITED STATES CONSULATE-GENERAL,
Guatemala City, March 21, 1891.

NICARAGUA.

REPORTED BY CONSUL NEWELL, OF MANAGUA.

Caoutchouc, or India rubber, is a product of this district, but the production is not fostered and consequently the rubber industry is falling off year by year, and soon the exportion from here will cease.

RUBBER HUNTING AND GATHERING.

India rubber is obtained in Nicaragua from the "Siphonia elastica." It is a tree from 50 to 60 feet in height. No India rubber has as yet been obtained in this country from any other source. The native name for rubber is "ulli," being a term applied to it by the Aztecs, and the Spaniards called the collectors of it, "ulleros." Some authorities in this country claim that the rubber tree of Nicaragua is not the "Siphonia elastica," but the "Castilloa elastica," that the former is the rubber tree of the Amazons. The weight of opinion I believe agrees with the botanical name first mentioned.

There are a number of methods employed by the rubber hunters, but I will confine myself to those in general use. The large rubber trees are generally felled and V-shaped canals, about 2 inches deep and 2½ inches wide at the top, cut around the tree 1 foot apart, and the rapidly flowing milk collected, through funnels formed of leaves, into hemispherical-shaped calabashes, each capable of holding from 3 to 5 pints, or in concave holes made in the ground, well lined with leaves.

Another method employed is, to cut into the tree, near the top and down to its base, one, two or three vertical channels, according to the size of the tree, through the exterior bark into the lactiferous vessels, and most often through these vessels into the woody fibers; then cutting numerous oblique channels on each side of and connecting with the vertical ones. This work requires ladders, which the rubber hunters improvise either by using the vines running on the trees, known as liana, which they intend to scarify, or cut from the numerous meshes of vines found convenient in the forests; by these, the ulleros ascend the trees and commence the work of scarifying near the top, and continue cutting one or two vertical and numerous oblique connecting channels uninterruptedly, until they have completed them. They work rapidly, in order to keep in advance of the fast-flowing milk. The milk is conducted from these channels by the same means as are mentioned in the first part of this article.

A third method used by the rubber hunters is to scrape off the outer bark of the trees with a "machete," commencing 8 or 10 feet above and extending down to within 1 or 2 feet of the ground. Clay alone, or a vine and clay, is placed around the tree, inclined, so as to form a ridge about 2 inches high on the lower edge of the scraped or bark-removed part of the tree. The inclination of this guard is made

sufficient to direct the rapily-flowing milk or emulsion into the receivers at the foot of the tree.

To make the milk coagulate soon the Indians, or rubber gatherers, make a decoction from the vine which they find twined around the India rubber trees. It has been found the most efficient way to effect coagulation. The vine is known as the liana; botanical name, "Calonyction speciosum," and this, on being added to the milk, in the proportion of 1 pint to a gallon, coagulates it to rubber, which is made into round flat cakes.

Sometimes the fresh milk is mixed with the coagulating decoction and then heated from 160° to 175° F., in the calabashes, and with a result apparently of a more elastic and less gummy India rubber than obtained by the other processes.

As the number of rubber trees grow less, the means used in gathering rubber becomes different. A few years ago the trees produced from 10 to 20 gallons of milk, and the rubber hunter then would take the milk and put it into a large hole in the ground and make one cake of it, known as "torta;" but now that the trees do not yield a great quantity of milk the plan of making a hole in the ground is fast being done away with. The best rubber is considered that which is taken from the long channels, which the ulleros cut in the trees, after the milk has been permitted to remain in the channels from one to two weeks. This rubber is known as "borricha," and it is thought to be superior to all other, because it contains less water.

So far as it has been possible to ascertain there is no American capital employed in the rubber business of this district. In fact, I am of the opinion that there is not any foreign capital invested in the rubber business in Nicaragua.

The amount of crude rubber annually exported from this district is about 40,000 pounds and is all destined to New York.

Some few years ago there was an export duty on rubber in Nicaragua, but the Government has since abolished the duty.

The natural supply of India rubber yearly decreases in Nicaragua. The cause of this is the habit of the natives, until lately, of cutting down the trees, thinking that they could thereby secure more milk. Trees generally stand but three years' tapping, and as they are not cultivated to any extent, it follows that at no distant period hardly any India rubber will be exported from this country.

Many of the trees have been destroyed through the large Harlequin beetle, "Acrocinus longimanus," laying its eggs in the cuts, and the grubs that are hatched boring great holes all through the trunk. The Government attempts no supervision of the forests; any one may cut the trees, and great destruction is going on amongst them through the young ones being tapped as well as the full-grown ones. The trees grow very quickly, and plantations of it might easily be made, which, in the course of ten or twelve years, would become highly remunerative.

RUBBER TREE CULTIVATION.

The few experiments that have been made in the cultivation of rubber were performed very unskillfully. The rubber tree has been planted, but not for the purpose of deriving any benefit from the yield of the tree. It was planted for shade to cacao and coffee trees in a few haciendas, no special regard being had in any case to the development of the rubber industry.

On a cacao estate near the city of Rivas, Nicaragua, is an indigenous tree of the "castilloa" family, which grows to the diameter of 4 feet, and of which variety there is on this estate about 9,000 trees. The parties interested in the plantation do not permit the trees to be tapped, although they would yield from 35 to 50 pounds of rubber biennially. Also near the same city a large number of trees were planted as shade protection to cacao, and produced large quantities and excellent quality.

The "Siphonia elastica" grows wild in the low marshy soil, where it should be cultivated. Experiments, however, have been made in growing rubber trees in the mountainous sections of Nicaragua, but not sufficient time has elapsed to prove whether it will be successful. Experience proves that the rubber tree grows best in those places where it has been found wild.

It is an incontrovertible fact, so far at least as Nicaragua is concerned, that the rubber tree is susceptible of cultivation. This assertion is based upon the success that has accompanied the few experiments that have already been made.

In this district there are large tracts of land suitable for growing rubber trees. The rubber section of Nicaragua is that portion extending from the mountains in the vicinity of Chontales, the northeastern part, to the Atlantic coast.

It is the opinion of those here, who are interested in rubber production, that it would be very profitable. So much so is this the belief that some few planters are taking steps to enlarge and improve their rubber plantations.

Though the Government of Nicaragua has exercised no supervision of the forests, and though it has taken no steps to stop the criminal destruction of the rubber trees, yet it has endeavored to stimulate the cultivation of rubber by issuing a decree giving a premium of 10 cents for every rubber tree planted, where the number does not go below two hundred and fifty planted by any one person. The decree also provides that the trees must be planted in squares of 6 varas for each plant. A vara is the Spanish yard, which is 32 inches.

NATIVE RUBBER BLANKETS.

There are no rubber goods manufactured in this consular district. The rubber hunters make rubber bags and blankets, but not for exporta-

tion. The rubber blankets made here excel anything in that line, so I am informed by travelers, that is manufactured. These blankets have a cool surface and do not become so heated when exposed to the sun as the blankets that are generally manufactured. They are also devoid of that gummy feeling that is natural to most rubber goods.

The natives use a very simple method to make these rubber articles. The milk as soon as extracted from the tree is put into a bottle and permitted to remain there for a few days, until it reaches the right consistency for use. A piece of canvas is then spread upon the ground and the milk poured from the bottles on it, and evenly distributed over the cloth by means of wooden paddles. The milk is not coagulated by any decoction, or by exposure to the air, as is usually the case, but is used in its natural state. A short time suffices for the milk to dry and the blankets are ready for service. The rubber bags pass through the same process, with the exception that the cloth is cut into proper sizes and then stitched into bags.

IMPORTS OF RUBBER GOODS.

It is impossible to secure any statistics in Nicaragua upon the amount and value of the rubber goods imported from the United States. Judging from the statements made to me by the leading merchants, it does not amount to a very large quantity. The principal article of rubber manufacture imported from the United States is hose.

Duty.—Foreign manufacturers of rubber goods, are required to pay a custom duty. India rubber and gutta-percha made up, no admixture of any kind, and boot elastics pay a duty of .332 cents. Rubber and such like mixed with linen, cotton, or hemp, table covers, and india rubber overcoats, pay a duty of .166 cents. The amounts here are in American money.

The total value of rubber exported from Nicaragua during the years 1887, 1888, 1889, and nine months of 1890, aggregated $137,615.81. There was exported $12,412.90 less worth of rubber in 1889 than in 1887. The amount to be shipped for the remaining quarter of 1890, added to that already exported this year, shows a falling off of $20,000 in comparison with the year 1887. Such is the rubber history of Nicaragua.

AMERICAN RUBBER GOODS.

American rubber goods compare most favorably with such as are imported from Europe. In hose and overshoes the American manufacturers excel the goods of other countries. The amount of rubber goods used in this country is small. India-rubber boots would find a good market in Nicaragua, and are much preferred to the rubber overshoes that are sent here. The India-rubber riding coats used in this country come mostly from Europe.

The character of the rubber goods used in Nicaragua consist of riding coats; the poncho, square shape, with a hole in the middle to put

the head through; the inverness, very wide and long, so as to cover the rider, horse, saddle, and saddle-bags, and overshoes. Outside of the articles named there are no other rubber goods used in Nicaragua.

The suggestions that I would offer concerning the extension of the trade of American manufacturers of rubber and other goods have been already covered by me in an article recently addressed to the Department of State, but it can not be amiss to reiterate those remarks here.

The merchants of Nicaragua state that the one serious drawback to the extension of the trade of the United States with Central America is caused in part by the manufacturers of America not granting the same length of credits as can be had in Europe.

They claim that they can get a credit of from eight to nine months in Europe, whereas in the United States it is difficult to get even six months; on small orders no credit at all is given.

Again, these merchants claim that in England and Germany they can purchase at a cheaper rate. Furthermore, that the manufacturers of those countries are more accommodating and willing to make an article that is suitable, and that meets the demands of this climate and the peculiar habits and customs of the people.

Another objection to the extension of Americas trade is, the high freight charges between that country and this. As an instance, I was informed by a merchant of Managua, and also a coffee producer, that it cost him to ship to New York a quintal of coffee, $3.30, when he could ship the same weight to England for a little over $2. This is one of the strong objections urged by Nicaraguan merchants against trading with the United States.

The manufacturers of the United States are unmindful of the manner in which they pack the goods that are destined for this country. The railroad system of Nicaragua takes in only the more important towns, so that there is a great section of country that must be traversed by means of mules and wagons. Into the interior the freight must be shipped upon the backs of mules or upon wagons over rough mountainous roads, so that in consequence of this fact it is impossible to handle large bundles of goods. Repeatedly have the manufacturers in America ignored the orders received from here for the packing of merchandise, so that the merchants of this country have become thoroughly disgusted with the business methods employed by the firms of the United States.

The conclusion to be deduced from what I have heretofore written is, that the trade of the manufacturers of rubber in the United States can be extended by giving longer credit; by selling goods as cheap as they can be bought in Europe; by making the freight rates on a par with those between Central America and Europe; by packing the goods according to the wishes of the merchants; and, lastly, by manufacturing articles that are proper for this climate and the customs of the people.

WILLIAM NEWELL,
CONSULATE OF THE UNITED STATES, *Consul.*
Managua, December 26, 1890.

INDIA RUBBER PRODUCING VINES AND TREES IN NICARAGUA.

REPORT BY MR. J. CRAWFORD, OF LEON.

[Ule, Mex., Hule Cent. Amer.; Caoutchouc, Fr.; from Caucho, South Amer.]

Elastic masses of the hydrocarbon caoutchouc (C_5, H_8) or (C_7 H_8 (Foraday) can be obtained from the milky emulsion caused to exude from more than twenty-five species of trees and large vines indigenous in Nicaragua. But in this paper* only such are mentioned prominently as can be caused annually to exude comparatively a large quantity of a sap or emulsion from which more than 20 per cent of India rubber can be separated by the crude methods now in use; also, in this paper some moderate producing species of the Euphorbiaceæ, as varieties of *Manahot*, and some species of *Sapoteaceæ* are only referred to in Division 2 because—

(1) They are poor soil and dry land species of slow growth, requiring from nine to twelve years to attain size and strength sufficient to annually replace an annual loss of from 3 to 12 gallons of the India rubber containing emulsion; often when over nine years old they require two years to recover from 10 to 15 gallons loss of sap.

(2) The more rapid and vigorous growing and much larger annual yielding species are sufficiently numerous and the areas of land suitable for their rapid growing and recuperating properties are of sufficient extent in Nicaragua—at least 1,500 to 2,000 square miles—for profitable cultivation until intelligently directed experiments have determined, reliably, the comparative value of all the different species from which India rubber can be annually obtained in this country.†

For convenience of reference in this paper the five well defined, geological divisions in Nicaragua are referred to and numbered from west to east.

Division 1 embraces about 15,000 square miles, all the large cities, and nearly two-thirds of the entire population in the country. It is the western or Pacific Ocean side of Nicaragua, and, generally has a soil of devitrified and decomposed volcanic ejecta, rich in iron oxides, potassa, lime, etc., and is well watered by streams flowing from the sides or base of its volcanic formed sierras and masses, or, where the water does not flow on the earth's surface, by wells or by sufficiently numerous rains to insure large annual crops of corn, sugar, grasses, and numerous varieties of excellent fruits. It contains in differently located areas of from 3 to 10 square miles each, in all about 500 square miles, which are suitable in soil, temperature, drainage, and atmospheric humidity (some

* From notes made during the past three years while examining the natural history (especially geology, mineralogy, botany, and archælogy of Nicaragua.)

† The number of square miles in Nicaragua is known only within 2,500 to 3,400 square miles; no reliable map of the country has ever been published; with her northern limits (now in dispute) as now permitted, she embraces between 47,800 and 48,600 square miles; if the northern limits were extended to the Rio Patuca—her natural boundary, her area would be about 52,000 square miles.

of the *sine qua non*) for the so far as known at present most desirable indigenous species of trees and vines from which in this country can be caused annually to flow the largest quantity of the emulsion, from which is separated the best quality [*i. e.*, containing the largest per cent of caoutchouc (C_5, H_8, or C_7, H_8)] of the elastic mass—India rubber.

A few tons of first-class India rubber are annually collected from groves of the trees and vines in the forests in five or six localities in this division, especially on the Peninsula of Cosegüina, and at Palacio and Marote, near the southern part of the Gulf of Fonseca.

Division 2 is the western side of the central mountainous part, containing about 5,000 square miles, and has but a few localities, in all about 100 square miles, where the necessary conditions of atmospheric humidity, soil, drainage, and temperature exist suitable for the, at present considered, most desirable varieties of the India-rubber producing trees and vines.

Several hardy, slow-growing, poor-soil loving species of *Euphorbiaceæ*, *Sapoleacea*, and *Moraceæ*, yielding India rubber, are found indigenous in this division (also in parts of the other divisions), which, after experience obtained by cultivating the more vigorous, rapid-growing families, would, most probably, under intelligent cultivation, become desirable kinds for comparatively high lands.

Division 3.—Includes the different mountain ranges, ridges, elevated plains, and valleys composing the cordilleras of Nicaragua, in all about 10,000 square miles. In the narrow, deep valleys between the mountains are found the only untouched groves of the most desirable species of the India-rubber producing trees and vines in this country. The species in this division are numerous and the trees are large, tall, and vigorous. This is the uninhabited part of Nicaragua, although it is its "Beulah Land," unsurpassed in any country in the desirableness of its altitude above the Pacific Ocean, pleasant climate, fertile soil, abundant water supply from the mountains, annual range of temperature, valuable timber, and freedom from sources of malaria. There are, probably, 300 square miles of the valleys in this division in which the cultivation of the most desirable of the India-rubber producing species would be successful and profitable. A company of citizens of the United States have recently contracted with the Government of Nicaragua to build a railroad from the Caribbean Sea through this (and all the five divisions herein referred to) to the Pacific Ocean, which route being an easy grade the railroad can be constructed rapidly.

Division 4.—This is the eastern slope from the central cordilleras to within 60 or 70 miles of the eastern or Caribbean seacoast, say, to about longitude 84° 30′ west from Greenwich. It embraces about 10,000 square miles in which are numerous areas; in all, 900 or 1,000 square miles that are nearly perfect in soil, temperature, drainage, low-protected altitudes, and atmospheric humidity for the rapid and vigorous growth of several indigenous species of the vines and trees from which large annual weights *of good* qualities of India rubber could be obtained. This division has

but few inhabitants, usually Indians, occupying villages of five to nine small, thatched roof, wall-less sheds each, located along creeks and many miles apart, although nearly all parts of it are desirable because of its fertile soil, abundant water supply, moderately warm climate, and large forests of several kinds of valuable trees. Less than twenty years ago the groves of India-rubber producing vines and trees of the best species were numerous and extensive and composed of trees 1½ to 3½ feet in diameter and 30 to 60 feet or more high. Now, those groves and nearly all the large and medium-sized trees producing India rubber have been destroyed: (1) By the "Huleroes," or India-rubber collectors, who cut down the vines and trees to secure, at one time, a large quantity of India rubber. (2) Too deep and rough incisions, cutting through the cambium layer into the woody fiber, killing the trees. (3) Rough incisions, under the numerous ragged edges of which insects, especially a species of beetles, the *Aconsymus longimanus* laid their eggs, and the grubs (larvæ) destroyed the trees in a few years.

The lands are national, but the Government of Nicaragua has not enforced any control over them. The party of Huleroes, or India-rubber collectors, who first arrive in any locality where the India-rubber producing vines and trees are numerous only claim that locality for the part of that year they remain there, and the party collects from each tree all that it will rapidly yield at that time, usually resulting in the death of the tree that year or within a few years. However, some of the Indians, the Amerrique and Wooeva tribes especially, claimed and enforced their claim for several years to selected localities, and by some greater care than usual have preserved alive some few groves of large India-rubber producing trees.

Young trees and vines of the best India-rubber exuding species are now, in large numbers, growing rapidly in this division; in some localities they could, by a few additions, be converted into orchards or groves of large area each, and then cultivated or properly cared for.

Division 5 is the eastern part of Nicaragua along the Caribbean seacoast, and 70 to 80 miles westward from that coral-reef coast, extending southward from "Cabo Gracia al Deos," about 15 degrees north latitude, to the southern boundary of the country, a few leagues south of the route considered the most advantageous for the Nicaragua Interoceanic Canal. It embraces about 7,000 square miles, of which about 200 are equally adapted as similar, above described, areas in Division No. 4, for the rapid growth of vigorous vines and trees which can be made to yield annually full crops of India rubber; these proper areas are found in this division along side of creeks and rivers above the usual annual floods. Eighty per cent of the population in this division live on sandy ridges near the Caribbean Sea and consist largely of negroes,*

* A large number of whom are runaways or descendants of runaways from the severe slavery labor system in the island of Jamaica and British Honduras. Many of them are creoles of English or Scotch and negro blood. They all claim to be subjects of the Kingdom of Great Britain and Ireland.

Sambos,* a few white subjects of each, Great Britain and Germany, and a few citizens of each, the United States of Colombia and the United States of North America; also a few, possibly 300, Musquita Indians (Moskoes). A large majority of the Indians, negroes, and sambos were "huleros," or Indian-rubber collectors, and are familiar with the recesses in the forests where once the groves of large trees existed, and where now very large numbers of small trees for planting into orchards or groves for cultivation can be found; also, they are familiar with the various processes used to scarify the trees, collect the exuding milk-white and milk-density emulsion, and the various modes used to coagulate it and to separate, en mass, the India-rubber globules, or more accurately the globules of caoutchouc (C_5 H_8 or C_7 H_8). These crude processes will be the basis or principles to be improved and used hereafter when intelligent interested persons plant and care for large groves or orchards of these species of trees and vines.

The characteristics of localities in Nicaragua, where grow most rapidly and vigorously the species of trees and vines that can be made to yield annually the largest quantity of the best quality India rubber, are:

(1) An alluvio-sandy soil having a largep ercentum of decomposing vegetable matter, well drained to a depth of 3 to 6 feet.

(2) A temperature never below 68° F., and usually above 80° F.

(3) Well shaded by a forest of large trees.†

Class and genera of some of the most desirable species of the India rubber trees:

Euphorbiaceæ: Spp. similar to *Siphonia* (Herea), *Manihot*, *Euphorbia*, etc.

Moraceæ: Artocarpus Tribe; spp. similar to *Castilloa*, *Artœarpa*, etc. Moreæ Tribe, spp. similar to *Ficus*.

Aponyneæ: Varieties of *Haucornia*, *Colophora*, *Urcolea*, etc.

Sapoteaceæ: *Palo de Vacu* (Cow Tree), the *Masaranduba* of Brazil.

[I have not yet examined and compared with sufficient accuracy to classify and name the species and varieties of the kind of trees and vines in Nicaragua.]

MODES OR PROCESS FOR OBTAINING THE EMULSION.

(1) The large trees, 2 to 4 feet diameter, were almost invariably cut down and a V-shaped canal, about 2½ inches wide at the top, was cut around the tree at intervals of about 2½ feet, through the cambium layer into the woody fiber, and the rapidly flowing milk, like emulsion, was conducted through improvised funnels made of leaves or of bark into hemispherical basins made of one-half of the oval or spherical fruit of a gourd-bearing tree of the crecentia species, and called a "cal-

*A mixture of three or more types, Indian, negro, Caucasian and Malays. They all claim to have English or Scotch blood, and to be subjects of Great Britain. They have the reputation of being bad characters, but it all appears to arise from jealousy on the part of the negroes against the sambos, who are faithful, strong laborers.

†These conditions are unsuited for a few good species that have been mentioned in Division 3, as indigenous in poor, sandy, comparatively high altitude soil.

abaso," and capable of holding 4 to 6 pints each, and in these calabasos conveyed to a slightly concave hole in the ground, which had been excavated, smoothed, and compacted; or concavities were made, compacted and smoothed inside, in the ground under each tree, encircling V-shaped incisions, into which concavity the exudation from that canal was collected.

(2) Incisions are made 2 to 3 inches wide and usually into the woody fiber with a heavy knife 24 to 36 inches long, called a "machete,"* commencing high up the tree and descending spirally, 18 to 24 inches apart, to the roots, and collected as described above in (1).†

(3) Vertical V-shaped canals 2 to 4 inches across the top are cut into the lactiferous glandular layer and often into the woody fibers from near the top to the roots of each tree, and numerous oblique channels are made on each side of and into the vertical canal or canals in each tree.‡

(4) Holes are cut, entering diagonally upward, in a line around the tree, commencing the lines as high up the tree as the "Hulero" can reach to or conveniently get up to. The interval between each hole on the same line is 12 to 14 inches. On the completion of each hole a small clay cup is attached to its lower side by clay. Into these cups the elastic containing emulsion is collected and the cups when full or when the emulsion ceases to flow from the hole, are emptied into calabosos or into large earthen dishes. These rows of holes are made at intervals of a foot or 18 inches down to near the roots of the trees or vines. It is a process more often applied to the variety of *siphonia* (heurea) than to the other species.

COAGULATING THE EMULSION AND SEPARATING THE INDIA RUBBER.

(1) The emulsion is placed under cover in a warm place, either in the shade or in sun-light, and in a few days a large part of the caoutchouc (C_5H_8 or C_7H_8) globules float to the top and cohere, but in the meantime fermentation has commenced and decomposed some of the globules and possibly prevented the formation of others.

(2) By heating slowly in the calabasos to about 165° to 175° § and

* A majority of the laboring class in Nicaragua carry a "machete" with them to use as a hoe, spade, or ax, and not only prefer those manufactured in the United States of America, but can, when bright and new, distinguish the genuine American make from the German imitations, although stamped and labeled with names of American manufacturers.

† This process is similar to, *but much rougher*, than that used in the turpentine orchards in North Carolina, Georgia, Alabama, Mississippi, Louisiana, etc.

‡ The Huleros ascend the trees by attached vines, or by an improvised ladder of vines, or by a hoop made of a vine and passed loosely around the tree and their body.

§ The "Huleros" have no thermometers. They watch the heated emulsion and determine the proper temperature by the formation of the India rubber on top of the liquid. Many tests which I made with thermometers indicated a heat from 160° to 170° Farenheit.

adding and stirring while hot, the expressed juice or the decoction proportion of 1 pint of decoction to 1 or 1½ gallons of emulsion the leaves or vines of the convolvulacæ tribe—as "Morning Glory," or Bindweed, or the decoction of the leaves or vines of the sweet potato—would be an excellent assistant to separate the India rubber.

(3) By heating thin layers of the fresh emulsion to 170° to 185° F., on a wooden paddle (such as they use for their canoes) coated with clay, in the dense smoke of slowly-burning palm nuts or other oil nuts, *Attalea excelcia*, *Eucturbe edulus*, etc., or in the smoke from the slowly burning wood of the liquidamber, a kind of "forest-gum" tree, or similar *Balsamifereæ*.

(4) Occasionally salt (chloride of sodium) or some of the alum salts are used, but these appear to injure the elastic properties of the India rubber.

ANNUAL YIELD.

Trees from 1 to 3½ feet diameter should yield annually from 2½ to 20 gallons of emulsion, from each gallon of which about 2 pounds of India rubber should be collected, that contains 30 to 35 per centum of *claoutchouc* (possibly more), and the remainder a watery liquid holding malic acid, tartaric acid, and nitrogenous compounds.*

April, May, and June are the months during which the vines and trees yield the largest per centum of India rubber, and also the time of the year when the trees and vines rally more rapidly fromthe loss of sap (emulsion), and also when the lacerations and incisions can best be protected from the larvæ of insects, especially the beetles.

WATER-PROOF CLOTH AND CLOTHING FROM THE FRESH EXUDATIONS.

The "Huleros," to make cloth or clothing waterproof, add a small per centum of sulphur or gunpowder to the fresh exudation and boil for a short time; then they stir the hot mixture and spread it over the stretched cloth as evenly as possibly two to four times, using as a spreading brush the fibrous, net-like coatings found at the attachment of the fronds to the cocoanut tree, *Cocos nucifera*.†

CULTIVATION: UNSUCCESSFUL EFFORTS AND CAUSES OF FAILURE.

Several unsuccessful attempts have been made to cultivate India rubber producing trees and vines so as to get from them annually a large per cent of the elastic mass, and on those failures the current opinion

*These "Huleros" guess with some accuracy at the number of pounds of India rubber they will get from a tree so soon as they get the emulsion to flowing from it freely.

†This fresh exudation waterproof is superior for rough usage to any made in Europe or in the United States, and less liable to "peel" or "scale" off. Aqua ammonia (of strength of the United States Pharmacopeia, diluted) will preserve the emulsion fresh for many months.

is expressed by even some of the most intelligent men in the country that cultivation decreases both the per cent of exudation and of caoutchouc. But recently, made careful inquiries have disclosed the faulty details, which I condense.

First. No proper regard was had to the locality, temperature, soil, atmospheric conditions, etc., selected for the indigenous plants that were transplanted to uncongenial localities. Some of the experiments were made by planting the India rubber producing trees in orchards with cacao (*Theo broma*) trees in lands and localities well suited to the latter tree, but not suitable for hardly any species of the former; also, the India rubber producing require more shade than the cacao producing trees.

Second. India rubber trees were removed from low, hot, well-shaded places in forests to a soil porous and dry, composed of volcanic-ejected ashes, sands, capilli, etc., and their growth retarded, nature changed to slow growing, small emulsion yielding, and struggling recuperative disposed trees.

CULTIVATION: OWNERSHIP OF SUITABLE LANDS.

Nearly all the lands in Nicaragua that are the most desirable for the cultivation of the best or largest producing species of India rubber vines and trees are national lands and can be bought at about $1 per "manzana," (about 1¾ acres). Probably the Government of Nicaragua will grant concessions of lands, or exemption from military duty of laborers, to a few persons to have two or three large experimental groves of India rubber producing trees planted and constantly cared for, provided the applicants came well recommended and with proof sufficient to convince the Government that they had the necessary capital and firm intention to make the experiments thoroughly.

The proper distance apart for planting such trees and vines is 20 to 25 feet.

The annual collection of India rubber can be commenced safely the fifth year from many species of rapid growing vines and trees, possibly in some localities the fourth year.

The planting and cultivation consists in cutting down and burning the undergrowth and weeds in the suitable forest localities, planting rapid growing shade trees where shade is needed, and then setting out the plants or cuttings taken from the forest or from a nursery carefully. The trees and vines grow equally well from the seed or from cuttings. The soil and surrounding conditions in which the most desirable indigenous species grow are those proper and necessary for the successful cultivation of that species.

TESTS IN THE FOREST BY WHICH TO DETERMINE THE BEST SPECIES.

In the place of writing a long critical botanic description of the many kinds of vines and trees from which India rubber can be obtained, and comparing their morphological structures, etc., so as to decide as

to the comparative quantity of India rubber each species will produce, attention is directed to the following easy, quickly made, reliable tests as to the India rubber producing value of each variety or species of tree found indigenous in its chosen locality.

(1) Cut through the bark into the lactiferous vessels and work between the fingers some of the exuding sap or emulsion; in a few minutes an estimate can be made of the per cent and elastic qualities of the contained India rubber.

(2) Cut from the tree a piece of the bark, removing with it the inner face of the bark, and estimate from the number of dry elastic threads found filling the pores and intercellular spaces the quantity and quality of the India rubber in that species.

Rice, banaas (*Musa sapientum*), plantains (*Musa paradisiaca*) and some of the fibrous *Agaras*, as sisal or henequin, peta, puica, etc., can be grown as interrow products in India rubber orchards; also, probably, the vine producing the vanilla bean (*Vinelleæ aromatica*), could be successfully cultivated alongside of the India rubber yielding trees, especially some of the *Ficus* species, without injuring the trees or decreasing their annual yield of India rubber.

Intelligent attention and care will improve the quality and increase the quantity of India rubber produced by the different species of trees and vines.

J. CRAWFORDS.

LEON, NICARAGUA; *October 16, 1891.*

P. S.—*Exports of India rubber from Nicaragua.*—The United States consul at Greytown, Nicaragua, could report from records in the custom-houses in Greytown and Bluefields, about two-thirds of the amount annually exported from the Caribbean seacoast of Nicaragua. The other one-third of the annual production of India rubber in that part of this country goes, without record in custom-houses in Nicaragua, in small schooners to Jamaica, British Honduras, etc. But a few tons are annually shipped from West Nicaragua.

J. CRAWFORDS.

SOUTH AMERICA.

ARGENTINE REPUBLIC.

REPORT BY CONSUL BAKER, OF BUENOS AYRES.

Caoutchouc in the crude state is not produced in this consular district, nor are there any manufactures of India rubber in the Argentine Republic.

In the forests of the Gran Chaco, about 1,000 miles north of this province, as also in the Republic of Paraguay, there is a tree whose name in the Guarani language is *Mangá-icé*, or India-rubber tree, which is everywhere very abundant, from the sap of which, I am informed, a most excellent article of gum elastic is manufactured. I do not know that any effort has ever been made to utilize the sap in the Argentine Republic; but in villa San Pedro, Paraguay, this industry is carried on to a considerable extent, but in a very primitive way. Not long ago an English gentleman named C. McDonald went from here to Paraguay with a view to engaging in this industry, but I have never heard the result of his undertaking. Perhaps our consul at Asuncion might throw some light on the subject.

E. L. BAKER,
Consul.

UNITED STATES CONSULATE,
Buenos Ayres, November 21, 1890.

DUTCH GUIANA.

REPORT BY ACTING CONSUL WYNDHAM, OF PARAMARIBO.

The caoutchouc, or India rubber, is produced in this colony under different species, the most important of which is the balata, or milk of the bullet tree, the export of which is attaining considerable importance, and will, it is believed, be very productive for a time—a time only, as there is no forest-conservancy law in the colony, and parties who are granted tracts of land for the exploitation of this industry are uncontrolled in their method of drawing the milk, which results in trees being totally destroyed to get the greatest amount of milk by the most inexpensive and quickest method.

The district where the largest quantity of balata trees are known to exist in the colony is that bordering on the Correntyne River, known here as the Nickerie district, and there large tracts of land have been given to an English firm to collect balata.

Balata, I may here mention, the produce of the bullet or "bully" tree (*Mimusops balata*), belongs to the order of *Sapotacæ* to which the *Dichopsis gutta*, and other gutta-percha trees belong, but it appears to be a superior kind of gutta-percha, while not exactly an India rubber, and its use in mixing with the latter has been found to be useful.

Dr. Hugo Muller, F. R. S., says:

> It seems balata is treated by the manufacturers simply as a superior kind of gutta percha, and therefore its name disappears when manufactured.
>
> Nevertheless, balata is distinctly different from gutta-percha, and this is specially manifested in some of its physical characters; for instance, it is somewhat softer at ordinary temperature and not so rigid in the cold.
>
> The chemical composition, however, is probably quite identical with that of gutta-percha and caoutchouc.

Without quoting further from this report it may be mentioned that the balata he reports is less affected by the action of light and air when exposed than is the case with gutta-percha under similar exposure, Dr. Muller also mentioned that specimens dried by evaporation proved harder than those produced by precipitation in spirits of wine, and the loss in the evaporation on washing and drying was only 25 per cent as compared to 38 per cent when precipitated.

Besides the bullet tree there are trees or plants known as the "ponckpong, which gives a valuable rubber, and again, "bartaballi" and a bushrope, to which collectors do not appear to have given a name.

The India rubber, balata, etc., industry, although carried on in the colony in a desultory way for a long time, has never until quite lately assumed sufficient importance to cause the local government to legislate upon it, and even now the law lately passed, of which I inclose a copy in the Dutch language, only lays down the regulations under which concessions are granted, and does not deal with the supervision of the treatment of the trees, or the method of extracting the milk.

With both these remarks I will confine myself to answering the points suggested for report.

1. Caoutchouc, or India rubber, is found in Dutch Guiana.

2. Yielded both by trees and vines, the names of which I have given in the body of this report as far as I am able to obtain them.

3. The method of collecting by the milkers is by cutting down trees and milking the stems,* by incision, and by circling the tree; in each case, as there is no protective law, the trees are, for the most part, ruined.

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*I am informed that cutting trees down is now prohibited, and that a law is being prepared imposing an export duty of 4 cents, American, per kilogram.

4. No American capital is yet engaged in the colony in this interest.

5. The exports are made to Demerara, and not being taxed there is no record of the production.

6. No export duty as yet. If the production becomes a factor in the colonies' budget it will most assuredly not escape taxation long.

7. There is a local outcry that the trees are being destroyed, but this is merely a local political matter not really touching the question. Nevertheless, unless legislated for, there is reason to fear reckless bleeding and cutting trees will destroy the belts of trees now extant, and the trees growing very slowly, and in nearly all cases failing to recover even after many years if improperly tapped, will eventually lead to a destruction of the balata production.

8. No experiments have been made on the cultivation of rubber trees, vines, or plants.

9. Nothing to report, as no attempts have been made.

10. The experience of those who have studied the growth in the Guianas leads to the opinion that the growth of the plant is subject to soil, locality, and drainage, and is not favorable to cultivation.

In connection with this subject I would advise parties interested to procure a copy of the "Timehri" or Journal of the Royal Agricultural and Commercial Society of British Guiana, volume IV, part II, edited by E. F. im Thurn, M. A., published by E. Stanford, Charing Cross, London Southeast, in which an able article on Balata and Balata industry appears.

WM. WYNDHAM,
Acting Consul.

UNITED STATES CONSULATE,
Paramaribo, November 5, 1890.

ECUADOR.

REPORT BY CONSUL-GENERAL SORSBY, OF GUAYAQUIL.

CRUDE RUBBER.

Caoutchouc, or India rubber, is a product of this district. The yield is by trees—by cutting the trees and gathering the gum in holes made in the ground at the base of the tree. The tree is often felled. There is no American capital employed in the rubber industry in this district. The export duty is 2½ cents (sucre*) per pound. The revenue derived in 1889 from the export duty on crude rubber was $13,980.53 (sucre). For years the natural supply has been rapidly diminishing, and the fear is entertained that the natural supply will continue to decrease.

The best rubber comes from the mountain districts. There is no attempt made toward cultivation.

* The Ecuadorian "sucre" (dollar) is valued at 85 cents American money.

It is believed that the rubber tree is susceptible of cultivation and that its culture would be highly profitable. There has been but little attention given the matter, and I could learn of but one attempt at cultivation. In 1884 Mr. Morla, a wealthy gentleman of Guayaquil, planted 20,000 trees, but inasmuch as the rubber tree does not bear until reaching a growth of ten years, the success or failure of the experiment can not yet be known. About 400 trees to the "cuadra" (1¼ acres) were planted, and it is expected that at maturity the yield will be about 3 pounds per tree.

The rubber trees of Ecuador are under no governmental protection, and unless they are on lands of private ownership they are, as a rule, cut down by the hunter.

RUBBER GOODS.

There are no manufactures in this district. The amount of rubber imported in manufactured form is limited, and statistical matter of a reliable nature can not be had.

There are four houses in Guayaquil handling manufactured rubber: two American, R. B. Jones & Co., and the successors of E. H. Henriques; one native, N. Novero & Co., and one European (French), Duran & Leveroy. The house of Henriques handle the American manufacture exclusively, claiming that in every respect it is superior to the European manufacture.

From the best information I can obtain I would estimate that of manufactured rubber imported per annum there is 7,500 pounds of square, round, and sheet packing; 5,000 feet of hose; 135 dozen pairs of overshoes and boots, the major part of which comes from the United States; 50 dozen ponchos; 10 dozen leggins, and 300 feet of cloth, the major part of which comes from England.

The export duty on manufactured rubber is 50 cents per kilogram, with 20 and 10 per cent additional.

Several of the houses mentioned prefer the English manufacture, claiming that they are superior in finish, and, for the same weight and finish, about 10 per cent cheaper than the American manufacture. I can offer no suggestion except that special inducements be offered the houses handling American goods exclusively, to the end that they, in turn, might offer such special inducements to the public as to monopolize the trade.

WILLIAM B. SORSBY,
Consul-General.

UNITED STATES CONSULATE-GENERAL,
Guayaquil, December 13, 1890.

BRAZIL.

THE AMAZON VALLEY.

REPORT BY CONSUL KERBEY, OF PARA.

INTRODUCTORY REPORT.

That there is a great danger of rapid diminution of the supply of crude rubber from the Amazon Valley is generally conceded by the more conservative and intelligent Brazilians.

On the other hand, there are those interested in the output who assert as positively that the rubber forests are practically inexhaustible, and specious arguments are made to the effect that the undeveloped territory of virgin forest is as extensive as that which is being tapped.

I am constrained to inject the personal observation here that I have heard precisely the same logic used by the energetic and loud-talking operators in the coal, oil, and gas fields in the United States.

There is no risk or labor in its production as compared with the search for gas and oil, or gold.

The operator does not sink money in shafts a thousand feet deep as an experiment. Neither is it necessary to bore holes in mountains or turn rivers from their courses to find gold and silver.

Figuratively, the gold grows on the trees in the Amazon Valley. All that seems to be necessary is to hire the friendly natives to enter the jungles, tap the trees with a hatchet as a wand, and the liquid gold runs into his coffers.

There are no dry holes in Amazonian valleys. The rubber tree is in sight everywhere; literally, the woods are full of them—full also, it may be said, of snakes, alligators, yellow fever, etc.

In the great rush for becoming suddenly rich lies the danger. The foreign operators here are killing the Brazilian geese that lay golden eggs.

It is not only a question of exhaustion of present supply, but the equally important consideration of an increase in production of rubber that will be necessary to meet the enormously developing requirement for this article. As the Department circular states:

> This destruction of the rubber tree is beginning to be the cause of uneasiness to our manufacturers for very potent reasons.
>
> It is of primary importance for the reason that, while the manufacturers of India rubber are steadily increasing, there would seem to be no efforts made for the conservation of the rubber forests.

I have made some careful inquiries of disinterested parties in relation to this question of supply, and find that in reference to this Lower Amazon field—or in the Delta—very many rubber forests are already exhausted.

No legal precautions have as yet been taken by the Government for the preservation of the trees.

Dr. Paez Carvolho, the popular vice-governor and senator-elect for nine years to the new republican Congress, informed me, just before leaving for Rio, that it was the purpose of the coming Congress to discuss the important question of conservation of rubber forests.

This may probably result in some legislation after some years. Probably the immediate effect of the agitation will serve to bring up the question of state rights, as to whether the national or state government should control these public lands.

At the present time and for some years past the only law in the matter was that embodied in the instinct of the native rubber gatherer and the selfish interests of the owner.

If but three gashes per day are made in the bark of the rubber tree, and the hatchet in the careless hands of the native does not penetrate or strike the wood, the tree does not appear to suffer from the treatment, except that the trunk grows thick and the scarred surface becomes irregular and bumpy. It will continue, however, in good health and yield milk in abundance for thirty or forty years. If the blow from the hatchet, however, wounds in the slightest degree the wood of the tree it dies. Decay begins at this wound. As the wood is soft, a little weevil called punilha enters the decayed spot, as a worm does the body, and hastens the destruction. The tree may drag out a miserable half-dead existence, but, as they say in Portuguese, it is *cancado*.

It will be seen how very easily the destruction of even almost "inexhaustible" forests may be completed by a mere blow of a hatchet in the hands of a marauding native.

For this reason very many of the once "inexhaustible" rubber swamps of the Lower Amazon are already wholly or partially abandoned, and the same fierce onslaughts are being made now upon the virgin swamps of the upper tributaries.

Renters of swamps are naturally less careful of the trees than are the owners, who manage their property from a central rubber station.

But, as previously indicated, the principal forests are "owned" in Para or Manaos by those dealers who are interested only in the present supply, and who have no interest in the future production.

CULTIVATION IN THE EVERGLADES OF FLORIDA.

Though I have no practical knowledge of the cultivation or its requirements, it has occurred to me that perhaps it might be worth while to attempt an experiment in rubber culture in the everglades of south Florida.

I spent last winter in that climate, where the conditions of moisture, heat, and soil seem to be about on a par with my observation here.

The overflowed lands of south Florida are below the frost line; the necessary conditions of rubber growing seem to be heat and moisture, *no cultivation* being required.

With a view of testing the matter I have sent to Prof. O. P. Winkleman, of Lake Geno, Orlando, Fla., some of the rubber nuts and plants for experimenting. This gentleman, being a thoroughly competent agriculturist of large experience, will be able to give the subject attention on his own property in the extreme southern portion of the State.

There is no question whatever as to either the practicability or the immense lucrativeness of rubber growing in this valley. Here it is solely a question of "time."

The only, but the eternal, objection is always raised that the rubber tree does not produce sufficient milk to justify until after a long time of growth. Naturally it seems like unspeakable selfishness to disinherit the future because of no present certainty of profit.

The Brazilian people are slow to act. The present seems to be enough for them. The prevailing sentiment seems to be of the "hunkidori" order, to let well enough alone. Truly, Brazil is the land of to-morrow, and probably the Anglo-Saxon will yet be called upon to develop this, the richest valley in the world.

I have gathered from reliable sources these facts and figures on cultivation. The *Siphonia elastica*, grown here spontaneously, is the best rubber tree in the world. The seeds or nuts are abundant and easily obtained. Here on the Lower Amazon they are now ripe and falling. They are somewhat smaller than horse-chestnuts, which they resemble in shape, and grow three in a capsule, which bursts with a sound resembling a firecracker, throwing the nuts to some distance. In one day a man could gather enough of them to plant a quarter section of land. They germinate easily and grow rapidly. They need plenty of moisture and heat, but not too much direct sunlight while young.

The young rubber trees can be found in the forest and transplanted with facility, being careful not to plant them too deep, spreading out the roots horizontally, and shading them until they have reached a certain height. But it is much less labor to plant the nuts in a garden bed, taking care to protect them from the sauba ants and the sun's rays until they are ready to transplant. When 6 or 8 inches high, they should be removed to small half-bushel baskets of earth, in which they may grow until they are 2 or 3 feet in height. They are then ready to be planted where they are intended to remain. The basket, which costs but a few cents, is set into the ground with the plant just as it is, and the work is done.

The trees will never crowd each other if planted 12 feet apart. That will give 538 trees to an acre of ground.

The land needs no preparation. The young trees will do well if planted in the original forest, but it would be still better to plant them among "second growth" of a last year's clearing. The second growth would give the necessary shade to the young rubber trees, and these would soon shoot above it. At the end of the first year the young trees will be from 8 to 10 feet in height, and from 12 to 15 at the end of the second year. No cultivation or care is necessary.

The rubber tree thrives well both on low and high land; but in order to yield plenty of milk it must have plenty of moisture in the soil part of the year at least. For example, on the river Purus, where the flood plains are covered with water from one to three or four months in the year, the trees on these levels yield milk in abundance, while thrifty trees of the same sort, not reached by the floods, do not pay for the trouble of tapping them. On the Lower Amazon not only the trees on the tide flats and annual flood plains yield milk in paying quantities, but also those on the high land (terra firma), because the abundant rains of six months or more in the year supply abundance of water to the soil. The extent of territory in the Amazon Valley that might profitably be planted in rubber trees would yield not only rubber enough to supply this world, but might safely take the contract for the whole solar system.

The great advantage of a compactly planted rubber forest, or grove, would be the saving of labor in the traveling through the swamp. The rest of the labor is light and quickly done, except, perhaps, the coagulation of the milk.

Taking the most unfavorable figures of the rubber swamp and applying them to the rubber grove, we may calculate that the man who cares for 150 trees in the swamp could care for an acre with its 538 trees. As 4 kilos is an average yield from the 150 trees, his 538 would yield him 15 kilos of rubber per day. One dollar per kilo is an average price here. Thus the laborer gets $15 per day, with no expense but his ordinary living expenses, during four or five months in the year.

Then why don't they plant rubber trees?

That is the same question that Brazilians are now beginning to ask each other. The only difficulty in the way, as previously stated, is that it takes from twenty to twenty-five years for a grove to come to yielding profitably. It is a long time to wait. But every one confesses that it would be a magnificent investment of capital. The few experiments that have been tried abundantly prove that they are right.

EXPERIMENTAL PLANTING.

In 1865 Sr. Joaquim Antonio da Silva, now deceased, but then living on the river Guama, 12 miles above the city of Para, had 20,000 young rubber trees planted on the low alluvial island in the river, called Bom Intento, which formed part of his estate. He paid to Francisco Bahia, the man who did the work, the sum of 16 cents apiece for the young trees when planted. The 20,000 young trees thus cost him a total outlay of $3,200.

Unfortunately the trees were all planted near the margin of the island on its whole circumference, as only a small part of the island was to be planted, and it was less trouble to plant near shore than to work his way through the jungle farther inland. The tide ebbs and flows with tremendous power, and tears away and builds up the island at one or the other end, alternating by periods of ten years. Conse-

quently the upper and lower ends of the island have both been torn away and built up again since the trees were planted twenty-five years ago. The sides of the island have also suffered some, so that now only about 1,000 of the original 20,000 rubber trees are remaining.

But they are fine trees from 30 to 40 feet in height and 9 or 10 inches in diameter. The present owner of the island is Sr. Joaquim Nunes da Silva Matta, a well-to-do merchant of this city, who inherited the island from its former owner. The trees yield abundantly, although they are being tapped contrary to the orders of the owner, who would like to have them lie idle a little longer.

Though the ground covered by the trees would probably exceed 2 acres in extent, the owner considers them a very valuable piece of property. The trees have never cost a cent for care or cultivation since they were planted, and if they had been planted a little farther inland, a few rods only, nearly the whole 20,000 trees would now be standing like those which remain.

Some of the American colonists at Santarem have planted some rubber trees, both on high and low land, though not in large numbers. The trees are as yet only a few years old, but they are growing finely and require no care.

JOSEPH O. KERBEY,
Consul.

UNITED STATES CONSULATE,
Para, December 3, 1890.

THE AMAZON VALLEY.

REPORTS TO CONSUL KERBEY OF PARA.

RUBBER TERRITORY.

It is a well known fact that the best India rubber, and the most abundant supply from any part of the world, comes from Para. The territory from which Para rubber is gathered is nearly or quite as extensive as all of the United States lying east of the Rocky Mountains. Some of the Para rubber has to come as far to reach Para as it has to travel from Para to reach New York. The tide-washed lowlands of the delta of the Amazon and the annual flood plains of the Upper Amazon and its tributaries are the places where it is found almost exclusively.

This consular district embraces four Brazilian States, three of which, Para, Amazonas, and Goyaz, lie within the Amazon Valley, while the fourth, Maranham, belongs almost entirely to the Atlantic slope, and has a different soil and climate.

Maranham produces but little rubber, and that of inferior quality (the Para merchants say). Its discovery there is limited and comparatively

recent, and the most approved methods of preparing it have not been adopted.

For lack of facilities for transportation, no rubber comes from Goyaz, although there are rubber forests there of unlimited and undeveloped extent. The freight by canoes would cost more than the market value of the rubber.

A small proportion comes from Bolivia and Peru, but the great bulk of the crop comes from the States of Pará and Amazonas. During the four months from July 1 to October 31 of the present year, of the 5,332 tons of rubber which has reached Pará from all parts of the Amazon Valley 1 per cent has come from Bolivia, 5½ per cent from Peru, 44 per cent from the State of Pará, and 49½ per cent from the State of Amazonas.

THE RUBBER TREES.

This rubber is all the product of trees. That which comes from Peru is said to be from a different tree from the one which produces the rubber found in Brazil, and the mode of gathering the rubber is also quite different. The name of this tree I have been unable to learn.

The rubber trees in the Brazilian part of the Amazon Valley belong mostly to one genus, *Siphonia*, or, according to some authors, to one species, there being about half a dozen different varieties. The popular name for all these varieties is *seringueira*.

Herbert H. Smith, in his "Brazil, the Amazons, and the Coast," p. 82 (Scribner's, 1879), speaking of the rubber-producing trees of the Amazon, appends a footnote as follows: "*Siphonia*, several species are admitted, of which this appears to be the true *S. elastica*."

The illiterate rubber gatherers affirm that there are different kinds of rubber trees (*seringueiras*) resembling each other; but some of them declare that they do not waste their time gathering the milk from any but the one "right kind," which is probably the tree Smith refers to in the note given above as the "true *S. elastica*." However, it is more than probable that those rubber gatherers who mix mandioca meal, gravel, nails, leaves, etc., with their rubber, would have no scruples about using an inferior quality of milk when obtainable. The *Siphonia elastica* is, however, a well-known and easily recognized tree, and abounds in large numbers even within the limits of this city. It is usually from 30 to 45 or more feet in height, and from 12 to 30 inches in diameter at the base, rapid growing, and soft wood. It is found scattered at intervals through the low forest lands, scarcely ever in groups.

To get a correct idea of the modus operandi of gathering and preparing the rubber, it is necessary to have some notion of the circumstances and surroundings, which also include the business customs and ways of the city and forest people.

TRADERS AND OWNERS.

The traders (negociantes) in the rubber country are generally rough-and-ready Portuguese or Brazilians, the larger part of them with little or no capital of their own when accounts are all balanced.

Very many of the rubber-swamp claims "belong," off and on, to business houses in Pará and Manáos. These they are ready to sell or rent. They, as a rule, prefer the former, as they often get the swamp claim back again, through the failure or death of the purchaser, in a few years, and for, perhaps, a fifth part of the price they sold it to him for. The unfortunate widow and orphans, when there are any, are shoved out into the forest penniless. It is said that on the upper river, the widow, if young and attractive, is often bargained off to another trader, and the choice given her to become his mistress or die in the forest, or worse.

The margins of the larger navigable rivers have been generally "prospected," and the most valuable rubber forests are now "owned" by some one, although there are immense tracts of unexplored territory on innumerable small tributaries, to be reached by canoes or small steam launches. The first title of a rubber swamp is generally determined by discovery and first possession. Frequently this remains the only title for years, and on the upper tributaries this is especially the case. The legal survey and purchase of the land from the Government being effected only when the land passes into the hands of the capitalists who receive it in payment of debt.

Meanwhile, the owner who preëmpted it must prove his right to it by constant rifle vigilance. No one leaves his hut without his sixteen-charge repeating rifle. There exists a class of desperadoes or "border ruffians," called in the frontier language "capangas." Many of the traders, both owners and renters of rubber swamps, have their gangs of "capangas" who are hired expressly for the purpose of maintaining the forest claim in question. Feuds often arise which at last end in a massacre and burn out. Only a few weeks since, such a massacre was surprised by a steamer suddenly rounding a bend on the river Jurua. Fortunately one woman had been tied to a tree to be kept until after the trading station was fired. She was rescued, and her testimony resulted in the arrest of thirty criminals implicated in the massacre. But generally the attack is not so daring; the night is chosen for the slaughter, and the criminals are undetected, though not usually unknown. It is a common saying that "he who has rubber will not go to jail."

Sometimes there is more formality even in the attack, and something like the rules of civilized warfare are observed. Capt. Guilherme G. Hoepfner, of the steamer *Eufrosina*, three or four years ago, witnessed a formal battle between two gangs of capangas, headed by their employers, who were disputing the right to build a shanty for trading supplies at the confluence of two little rivers. The captain spent nearly the whole night before trying to persuade the stronger party to leave the other

in the rightful possession of the point of land he had proper possession of, but to no avail. In the morning more than 2,000 shots were exchanged across the little river from the repeating rifles, all of which resulted in one bullet hole through the shirt of the leader of the attacking party. He immediately stuck up a piece of white cloth on a stick from behind his stump, and the firing ceased. A few minutes later he was in his canoe with his capangas and paddling unmolested down the stream in retreat.

Such was the state of things formerly on the Lower Amazon, but law has gradually taken the place of brute force as far as land titles are concerned.

ENTERING BUSINESS.

Now, when a man decides to go into business as a trader, having but little capital, as is the case most frequently, he goes to some one of the native business houses which deal directly with the traders and are called "casas aviadoras," or "furnishing houses." With the firm he makes a bargain to take one of their rubber swamp claims and work it for one or more seasons for a stipulated compensation. He gathers up a number of persons—Indians, negroes, half-breeds, white men—any sort of fellows that he can induce to go with him for the season. He obtains on credit from the firm supplies for his company and goes to the swamp. He probably finds the principal shanty (barracão) still standing from the previous year; but the thatch roof will need some mending or renewing, as also the wattle and daub sides. This will be the trader's headquarters for provisioning his rubber gatherers. The men will build their huts for their own shelter. These are near the river brink, usually. Poles are driven into the mud, and on these a floor of small palm trunks is laid. Taller poles support a palm thatch roof, and the hut is considered finished. If any of them have brought a woman along they may make a room for her convenience by partitioning off part of the floor with palm leaves. In two or three days their homes are finished and they turn their attention to the forest paths, which they must clear out and open to reach the rubber trees; for since the previous season they are overgrown by the luxurious tropical vegetation.

It is the closing of the rainy season, May or June on the lower Amazon, when the milk of the rubber tree begins to be fit for gathering.

BUSINESS IN THE SWAMP.

Each laborer rents from the trader a certain number of paths (estradas), so that he will have one hundred to one hundred and fifty trees to work. The rent he is to pay to the trader is 20 per cent of the rubber yielded by the paths he takes. It is, further, "swamp law" that the gatherer is to obtain all his supplies from his trader and turn in to him all his rubber. Each gatherer has his own private mark, which he

puts on his rubber, and it is shipped to Para to the furnishing house, where it is weighed and each gatherer is credited with the market value of the rubber on the date of arrival. The trader is obliged by the "custom-made" swamp law to turn in to his furnishing house all the rubber which the gatherer has in like manner been obliged to turn in to him. Peddlers in canoes visit the rubber gatherers, and by an easy game of hide and seek smuggle in provisions to the gatherers and smuggle away rubber, just as steamer captains carry cash to purchase and smuggle away rubber from the traders, thus relieving the terrible monopoly which this credit system has thus rendered lawful. But the relief is small, as the canoe peddlers do not peddle just for the pleasure of peddling.

PROVISIONS.

The provisions which the rubber gatherer receives consist mostly of salt fish, jerked beef, salt, sugar, coffee, mandioca meal, and rum. The rum should have been placed first in the list and repeated with each item, for the average rubber gatherer never orders salt fish without rum, nor jerked beef, nor salt, nor sugar, nor anything else without heading the list with rum (cachaça). These provisions have paid a profit of from 25 to 50 per cent or more to the furnishing house. The trader also puts an equal profit for himself on the price for the provisions. The freight is also no light matter; so that the rubber gatherer has to pay two, three, or four times the Para price for the plainest necessities of animal life. What the miserably fed swamp laborer pays for his mandioca meal, salt fish, and rum would give him excellent boarding-house fare in almost any city in the United States.

WHITE SLAVERY.

In addition to what I have already said concerning the exorbitance, justified in part by the great risks, but none the less oppressive upon the poor laborers, the following translation from an article published by the Conselheiro Paes de Andrade in the paper, "A Republica," of this city, on the 11th instant, will help to understand the desperate fight which the poor rubber gatherer has to make for his existence. The author is the same Conselheiro Paes de Andrade whose valuable series of articles on land property titles in Para* were recently sent to the State Department by this consulate. He says:

The rubber gatherer obtains fabulous, profits during four months of the year—that is, while he works; but he spends lavishly, without remembering the coming winter.

From his first year onward the laborer loses his independence and mortgages his future.

Debt confronts him from the very start, which, instead of being paid off, grows upon him until the laborer is reduced to the necessity of a life of disguised slavery.

If he dislikes his employer because he maltreats him, he is sold to another employer for one, two, or three contos of reis ($500 to $1,500.)

*The article referred to by the consul follows this report.

These sales are made without cash payment, but the poor laborer is obliged to pay the debt with his labor, and he remains perpetually enslaved, because he continues to follow the same kind of a life without paying up anything.

The business is bad for all concerned.

The capitalist, the furnishing merchant, trusts his capital to the venturous employer of labor, the country trader located in the rubber swamp, of which he is the owner or renter, and he bears the expenditures of the rubber gatherer, for whom he has paid an enormous debt to his former employer.

If rubber brings a good price—that is, if the year is good—the employer of the laborers saves himself and the capitalist, but the laborer remains always enslaved; but if the year is financially bad, the capitalist breaks; the tricky trader changes his house, and gets his new furnisher to buy for a third of their value the paper of the unfortunate man who broke, and he goes to pay up all his debit to the liquidators of the broken house, thus profiting by the misfortune of the one who helped him on.

Meanwhile no discount is made on the debts of the laborers, of whom he then becomes master and possessor, often exercising his lordship even over the poor man's family. * * *

The above quotation reveals but a small part of the crookedness that is practiced in the rubber swamps. What the Conselheiro has stated is all "legitimate" business in rubber circles, and censured only by the sufferers and such high-minded men as he. The confessedly fraudulent methods of cheating and robbing, which the perpetrators prefer not to confess, are multitudinous.

RUBBER GATHERERS.

The rubber gatherer rolls out of his hammock as soon as it is light in the morning, takes his gulp of rum and his calabash of coffee, starts out to visit his rubber trees. He wears a short pair of breeches, and sometimes a shirt. He goes barefoot, for he must wade through the swamp mud and ooze of the tide up to his knees, and often up to his waist in water. He takes a basket full of earthenware gill cups, a hunk of adhesive clay, and a little narrow-bladed hatchet.

If he adopts the most approved method of tapping the trees, he reaches as high as he can with his hatchet, making an incision in the bark, but not reaching through to the wood. The milk immediately begins to issue in rapid drops or little streams. With a spat of the adhesive clay he immediately fastens one of his little gill clay cups just below the bleeding gash, and molds the clay so as to make all the rubber milk flow into the cup. Three such gashes, at equal distances around the tree, and at an equal height, is the rule. The next day he will make three more gashes in the same way, just a little below these three, and so continue, until by the end of the season he will have reached the level of the ground. Each of his 100 or 150 trees is treated in the same way, and he returns home after having traveled from 3 to 5 miles, barefoot and almost naked, through thorny thicket and malarial steaming swamp.

COAGULATING THE MILK.

When he reaches his hut again he takes another gulp from the demi-john, snatches a breakfast of salt fish and mandioca meal, which are often moldy from the reeking damp of the swamp, and then starts out again with his calabash buckets to gather the milk, which by this time has ceased to flow. His gill cups are full, or nearly so, and when he reaches home he has milk enough to make four kilos of rubber, on an average. The next task is the coagulation of this milk. For this purpose he has a jug-shaped furnace, made of earthenware, called a *boião*, open at bottom and top, and with a small aperture at the side to admit the air for the combustion. In this piece of furniture he builds a fire, or rather a smudge, with the nuts of the inaja or urucury palm. The dense black smoke which rolls from the open top of the *boião* is the reagent which coagulates the milk. For this purpose the rubber gatherer has a circular-bladed paddle, like the paddle of a canoe, which he smears over with clay so that the rubber will not adhere to it. This is suspended by means of a cord from the limb of a tree just above the smudge. The milk is poured over the blade of the paddle, which is then turned over and round about in the smoke, and in a few moments the film of rubber is coagulated. The same process is repeated of wetting with milk and smoking the growing lump until it reaches the weight of from 5 to 25 kilos or more. Then it is slipped off from the paddle as a mitten is pulled off from one's hand. This ball is the crude rubber of commerce. If the coagulating has been carefully done it is "fine" rubber; if carelessly done, and the ball on being cut open at the exporting warehouse shows signs of poorly-coagulated milk or slight mixtures of foreign substances, such as mandioca meal, it is classified as "middling fine" (*entrefina*). There is also a coarser grade still, called *sernamby*, the native Indian word for "shells." This grade is composed of the scraps and bits that have dried without coagulation proper, especially the linings that form in the little earthenware cups and in the calabashes and buckets used in handling the milk, as also the drippings that run down the trees from accidental wounds. These are all rolled up together in a mass and would bring as good a price as the middling fine, were it not for the leaves and other rubbish that manage "innocently" to stow themselves away in the lump.

CAOUTCHOUC.

The method of gathering and preparing the caoutchouc of Peru is to fell the tree and cut it up into bits, limbs and all, and let the milk run out from the wood into hollows dug in the ground. It is then coagulated in these pools by mixing it with ordinary soap. It produces a most vile smelling compound which sells for about the same price as Para sernamby.

Other methods of coagulation have been tried, but none have given such satisfactory results as the laborious method of fumigation. Alum stirred into the milk will coagulate it rapidly and with far less labor, but the rubber thus prepared is of poorer quality.

Statement showing the exports of rubber from Para, by qualities, in 1888, 1889, and 1890.

Year.	Fine.	Medium.	Coarse.	Caoutchouc.	Total.
	Kilos.	*Kilos.*	*Kilos.*	*Kilos.*	*Kilos.*
To the United States:					
1888	4,860,617	899,491	2,402,045	643,992	8,887,145
1889	4,750,102	937,519	2,811,377	596,940	9,095,938
1890	5,211,813	867,977	2,934,899	577,276	9,591,965
To Europe:					
1888	4,193,726	423,200	1,095,080	411,970	6,123,976
1889	4,617,708	659,384	1,266,675	249,892	6,793,695
1890	4,480,068	636,383	1,299,525	286,980	6,802,956

RESUMÉ.

TO—	1886.	1887.	1888.	1889.	1890.
United States	7,970	8,528	8,887	9,096	9,502
Europe	5,036	5,558	6,124	6,794	6,803
Total	13,006	14,086	15,011	15,890	16,395

Rubber receipts at Para.

Month.	1886.	1887.	1888.	1889.	1890.
	Tons.	*Tons.*	*Tons.*	*Tons.*	*Tons.*
January	1,520	1,345	2,990	2,900	2,330
February	1,065	1,200	1,390	1,480	1,310
March	1,220	1,300	1,200	1,440	1,700
April	745	490	830	940	870
May	420	540	885	740	660
June	430	520	600	640	640
July	560	780	670	670	700
August	935	1,220	1,090	1,020	1,100
September	1,180	1,210	1,080	1,130	1,430
October	1,680	1,405	1,580	1,560	1,760
November	1,350	1,900	1,680	1,640	1,880
December	2,235	1,950	1,730	1,780	2,190
Total	13,340	13,880	15,085	15,940	16,570

Stock on hand January 1, 1890	tons.	1,015
Receipts in 1890		16,570
Exports in 1890		16,395
Stock on hand January 1, 1891		1,190

Rubber quotations in Para.

Months.	1889.							
	Island rubber.				Amazon rubber.			
	Prices.		Exchange.*		Prices.		Exchange.*	
	Lowest.	Highest.	Lowest.	Highest.	Lowest.	Highest.	Lowest.	Highest.
	Reis.	*Reis.*			*Reis.*	*Reis.*		
Jan	1,850–1,000	2,000–1,150	27 7/8	27 7/16	1,950–1,100	2,100–1,250	27 7/8	27 7/16
Feb	1,800–1,000	1,850–1,050	27 3/4	28	1,850–1,075	1,900–1,100	27 13/16	28
Mar	1,700– 900	1,850–1,050	28 1/8	28	1,800–1,000	1,900–1,125	28 1/8	28 1/8
Apr	1,700– 900	1,900–1,100	28 1/8	27 3/4	1,850–1,050	2,000–1,200	28 1/8	27 3/4
May	1,900–1,100	1,950–1,100	27	27 7/16	2,000–1,200	2,050–1,250	27 1/8	27
June	1,800–1,000	1,900–1,100	26 3/4	27 1/8	1,950–1,150	2,100–1,250	26 3/4	26 3/4
July	1,700– 900	1,800–1,000	27 7/16	27 1/8	1,850–1,000	1,950–1,150	27 1/4	27 1/8
Aug	1,700– 900	1,750– 950	27 1/4	27 1/8	1,800–1,000	1,800–1,000	27 5/16	27 1/8
Sept	1,750– 950	1,870–1,100	27 1/8	28	1,850–1,050	1,970–1,200	27 13/16	28
Oct	1,870–1,100	2,000–1,250	28	28	1,970–1,200	2,100–1,300	28	28
Nov	1,970–1,200	2,100–1,300	28	27 5/8	2,100–1,300	2,175–1,450	28	27 5/8
Dec	2,100–1,300	2,480–1,500	27 5/8	25 1/4	2,150–1,400	2,550–1,650	27 5/8	25 1/4

* London.

Months.	1890.							
	Island rubber.				Amazon rubber.			
	Prices.		Exchange.		Prices.		Exchange.	
	Lowest.	Highest.	Lowest.	Highest.	Lowest.	Highest.	Lowest.	Highest.
	Reis.	*Reis.*			*Reis.*	*Reis.*		
Jan	2,950–1,250	2,300–1,400	25	26	2,070–1,270	2,450–1,550	25 1/8	25
Feb	2,200–1,400	2,550–1,650	24 5/16	24 5/8	2,350–1,550	2,650–1,750	24 5/8	24 5/16
Mar	2,600–1,700	3,000–2,100	22 5/8	23 5/16	2,750–1,800	3,200–2,300	24	22 5/8
Apr	2,850–1,950	3,300–2,400	20 3/4	22	3,625–2,125	3,500–2,600	22 3/8	20 3/4
May	3,250–2,250	3,350–2,350	21 1/16	21	3,500–2,600	3,500–2,600	21	21 1/2
June	3,000–2,000	3,350–2,350	21 1/8	22 1/4	3,200–2,100	3,500–2,600	22 1/2	21 1/8
July	3,000–2,000	3,100–2,050	23 1/4	23 1/2	3,100–2,050	3,150–2,150	23 1/2	23 1/4
Aug	3,100–2,000	3,300–2,300	22 1/4	23 1/4	3,150–2,150	3,500–2,500	23 1/4	22 1/4
Sept	2,900–1,900	3,300–2,300	22 1/4	22 3/8	3,320–2,320	3,500–2,500	22 1/4	22 1/4
Oct	2,350–1,250	3,000–2,000	22 1/4	24 1/16	2,600–1,600	3,200–2,200	24 5/16	22 1/4
Nov	2,450–1,450	2,550–1,550	23 1/4	23	2,525–1,525	2,800–1,800	24 1/4	22 3/8
Dec	2,250–1,250	2,800–1,800	21 1/2	22 1/4	2,500–1,500	3,000–2,000	22 1/4	21 1/2

JOSEPH O. KERBEY,
Consul.

UNITED STATES CONSULATE,
Para, January 16, 1891.

THE AMAZON VALLEY.

REPORT BY CONSUL KERBEY, OF PARA.

SUPPLEMENTARY REPORT.

I have the honor to submit herewith the detailed statement or the statistics on rubber which I previously mentioned as part of my exhaustive report on this subject.

This matter could not be compiled until after the close of the year 1890, and as a matter of special favor to me it goes by first opportunity thereafter.

The statement is in every respect reliable and exceedingly important in this, that these figures will correct some false impressions. I submit it without comment, but it will be observed that the American firms are not the heavy or principal shippers and do not control the rubber trade.

Two-thirds of the exported rubber goes to the United States, but notice in other reports that three-fourths if not four-fifths of the imports to pay for this rubber comes from Europe.

There is no effort here to introduce American trade on the part of the rubber dealers.

In this connection may I be permitted to say that my efforts to secure honest reports as consul have served only, it would seem, to antagonize the rubber interest. I am in no sense indebted to any rubber firm or to any American firm for these facts and figures.

Mr. José Agnes Wabrin, an accomplished Brazilian gentleman, educated in Germany, and long a resident of Para, manager of the extensive Companhia Mercantil do Para, has kindly assisted me in my researches, and I desire that suitable acknowledgment be made to this gentleman.

Statement showing the quantities of crude rubber exported from Para during the year 1890.

Shippers.	United States.				
	Fine.	Medium.	Coarse.	Caucho.	Total.
	Kilos.	*Kilos.*	*Kilos.*	*Kilos.*	*Kilos.*
Pusinelli, Prüsse & Co	689,814	73,836	339,902	143,430	1,246,982
LaPoque da Costa & Co	722,345	156,539	767,641	49,737	1,696,762
Companhia Mercantil	765,437	141,561	409,861	3,815	1,320,674
Robinson & Norton, Norton & Co.*	979,501	143,440	459,828	57,424	1,640,193
J. Vianna & Co	341,192	82,367	121,022	3,618	548,199
R. F. Sears & Co.†	429,292	50,667	210,782	4,314	695,055
Denis Crouan & Co.†	29,920	4,080	13,960	.....	47,980
W. Brambeer & Co	209,248	15,470	161,512	.....	386,230
Singlehurst, Brockle't & Co	101,322	11,889	94,069	220,225	427,505
Sundry small shippers exported direct from Manaos	40,216	665	39,799	48,030	128,710
	903,026	187,463	316,503	46,683	1,453,675
Total	5,211,813	867,977	2,934,899	577,276	9,591,965

Shippers.	Europe.					Total.
	Fine.	Medium.	Coarse.	Caucho.	Total.	
	Kilos.	*Kilos.*	*Kilos.*	*Kilos.*	*Kilos.*	*Kilos.*
Pusinelli, Prüsse & Co	1,146,458	175,718	222,551	67,804	1,612,531	2,859,513
La Poque da Costa & Co	591,428	47,234	197,683	.....	839,346	2,536,108
Companhia Mercantil	324,460	35,230	155,780	.....	515,470	1,836,144
Robinson & Norton, Norton & Co.*	170	.....	300	.....	470	1,640,663
J. Vianna & Co	117,554	20,787	89,307	.....	227,648	775,847
R. F. Sears & Co.†	50,760	960	11,691	.....	63,411	758,466
Denis Crouan & Co.†	411,600	51,810	120,320	1,980	585,710	633,690
W. Brambeer & Co	200,067	19,720	848	.....	220,635	606,865
Singlehurst, Brockle't & Co	108,632	13,923	23,088	7,745	153,388	580,893
Sundry small shippers exported direct from Manaos	217,930	19,971	79,551	23,508	345,960	474,670
	1,308,009	251,030	398,406	280,942	2,238,387	3,692,062
Total	4,480,068	636,383	1,299,525	386,980	6,802,956	16,394,921

* Flint & Co., of New York.
† W. R. Grace & Co., of New York.

RÉSUMÉ.

Description.	United States.	Europe.	Total.
	Kilos.	*Kilos.*	*Kilos.*
Fine	5,211,813	4,480,068	9,691,881
Medium	807,977	696,383	1,504,360
Coarse	2,934,899	1,299,525	4,234,424
Caucho	577,276	386,980	964,256
	9,591,965	6,802,956	16,394,921

Statement of rubber exported from Para for month of October, 1890.

Exporting firms.	To the United States.					To Europe.				
	Fine.	Extra fine.	Sernamby.	Caucho.	Total.	Fine.	Extra fine.	Sernamby.	Caucho.	Total.
	Kilos.	*Kilos.*	*Kilos.*	*Kilos.*	*Kilos.*	*Kilos.*	*Kilos.*	*Kilos.*	*Kilos.*	*Kilos.*
Latocque, da Costa & Co	80,107	14,560	78,615	.....	173,282	150,171	5,878	65,681	.....	221,730
Pusinelli, Prusse & Co	44,208	6,590	8,280	17,287	76,345	128,663	21,385	33,569	.....	183,587
Companhia Mercantil do Para	45,922	16,179	26,166	.....	88,267	92,310	3,230	28,280	.....	123,820
Robinson & Norton	108,630	15,470	47,940	516	172,556	.....	.....	.....	.....	.....
Denis Cronan & Co	13,600	2,550	4,800	.....	20,950	43,210	4,890	15,440	.....	63,540
R. F. Sears & Co	30,280	4,760	13,500	.....	48,520	20,060	.....	6,900	.....	26,960
W. Brambeer & Co	31,323	2,380	11,700	.....	45,403	9,690	850	.....	.....	10,540
Singlehurst, Brocklehurt & Co	1,137	181	5,007	10,443	16,768	2,436	174	175	.....	2,785
Ivianna & Co	8,960	3,680	1,960	.....	14,600	.....	.....	.....	.....	.....
Diversos Exportadores	.....	.....	520	6,126	6,646	58,449	1,997	11,022	825	72,293
Exported direct from Manaos	.....	.....	.....	.....	.....	118,888	9,323	25,482	18,564	172,257
	364,147	66,350	198,468	34,372	663,337	623,847	47,727	186,549	19,389	877,512

To America	663,337
To Europe	877,512
Total	1,540,849

The significant feature is that previous statements have shown that two-thirds of the rubber exported has gone to the United States. This report indicates a change in the tide, three-fourths having gone to Europe during October.

As indicating the nationality of the carrying trade, I append herewith a statement showing by what steamers the rubber was shipped.

Flag.	Steamers.	Whither.	Quantities.
			Kilos.
British	Amazonense	Europe	472,835
Do	Gregory	America	234,004
American	Alliança	do	137,344
British	Lafranc	Europe	247,297
American	Lequranca	America	129,520
British	Paraense	do	162,469
Do	Manuense	Europe	157,380
Total			1,540,849

British vessels took to America	396,473
American vessels took to America	266,864

This indicates that the English do the bulk of carrying to the United States as well as all of that to Europe. They also control the trade from Manaos.

J. O. KERBEY,
Consul.

UNITED STATES CONSULATE,
Para, January 9, 1891.

BAHIA.

REPORT BY CONSUL BURKE.

ACKNOWLEDGMENT.

I would say that I am indebted to Mr. S. S. Schindler, of New Haven, Conn., for the information herein contained relative to the business of gathering the milk and the process employed by the gatherers.

Mr. Schindler seems thoroughly conversant with the methods employed. He was in the business for some time, I believe, and invented a process of immediately converting the milk into rubber, as well as for preserving the milk for a long time after its extraction from the tree and then converting it as quickly as if it were freshly taken from the tree.

THE RUBBER TREE.

Caoutchouc is yielded by the tree whose botanical name is *Hancornia speciosa.*

The tree commonly known as the *mangaba*, or *mangabeira* as here called, belongs to the family of Aprocynacæ. It is of medium size, very graceful in appearance, with drooping branches, and small oblong leaves beautifully and finely veined and rounded at the apex. The entire tree is of a rich, deep, glossy green. A forest of these trees is a glorious sight, presenting as it does such a strikingly beautiful contrast to the vegetation and foliage surrounding it and the cloudless blue of the tropical sky.

The mamgabeira yields a thick viscous juice or milk of a bitter taste, rom which the rubber is prepared. The tree is very much appreciated by the natives because of a fruit which it bears. This fruit has a yellowish color marked with reddish spots, and is about the size of a peach plum. It has a fine aroma and a delicious taste, but is fit to be eaten only when it falls from the tree; it is then perfectly ripe. A beverage is also made from the juice of the fruit which is most delectable to the taste, and conserves or *doces*, which are very palatable for Brazilians. *Doces* are also made from the fruit of the goyava, the bitter orange, the citron, etc.

This tree in general is found only on loose, sandy soil, such as, without fertilizing, would be unproductive for cereals, tobacco, coffee, sugar cane, and in fact for most classes of agricultural products.

RUBBER GATHERING.

The method of conducting the business of rubber gathering properly should be as follows:

A person supplies himself with about twenty small, round tins and a large knife (facão). With this facão he should make, at or a little distance from one another, around the trunk of the tree, a few oblique incisions sloping downward. This done, the tins should be placed at the foot of the tree to receive the milk as it exudes from the tree, and when full should be emptied into a large tin or barrel placed near by. Each person engaged in the business can look after from 20 to 30 trees during a day, and if properly done can collect from 10 to 15 kilograms of clean milk. If too many incisions are made in the tree, unless it is a very large one, as are those in the interior of the States of Minas, Geraes, and Goyas, these incisions will weaken or kill it. This is too often the case with the *Seringeira* tree of the State of Para. If the *mangabeira* be fairly treated it will yield a fair quantity of milk every three or four months, and would doubtless prove a paying business to owners of large tracts of land that are really unproductive for any other purpose. For coagulating the milk there are several processes, some of these producing a very pure commercial rubber, others throwing upon the market a poor quality mixed with bark and sand.

It is owing to the fact that proper care is not exercised in the collecting of the milk that is the cause of the poor quality of rubber which often finds its way into the market. Too many incisions are made in the tree, and the milk exuding too freely runs down the trunk to the ground, from whence it is gathered up, mixed with dirt and rubbish, then rolled into balls and a layer of clean milk worked over it, when it is ready to be worked off on some purchaser as rubber of a superior quality. The largest producers of mangabeira rubber in this section of Brazil are in the States of Minas and Goyez, from whence about one-half is shipped to Rio de Janeiro, the other half to Bahia. That to Bahia is brought some distance down the river San Francisco, then by mules and, lastly, by rail till it arrives at Bahia. The States of Pernambuco and Ceará have forests of mangabeira trees also, as well as that part of the State of San Pemlo bordering upon the State of Minas.

As far as I can learn, no American capital is employed in rubber gathering.

EXPORT OF CRUDE RUBBER.

The exportation of crude rubber for the year 1889, according to the custom-house figures, was as follows:

	Kilos.
To Germany	90,565
To United States	40,699
To England	7,174
To Portugal	216

I would say the figures as given by the custom-house of the exportation to the United States differ from those recorded in the invoice book in this consulate. The invoice book shows there were shipped to the United States during 1889 but 29,840 kilos, as against the 40,699 kilos as given by the custom-house for the same year.

EXPORT DUTY.

There is an export duty of 14 per cent. The amount of the revenue from it annually I have not been able to obtain.

No fear of the exhaustion of the supply seems to be expressed on this head.

CULTIVATION.

No experiments whatever have been made in the cultivation of the rubber tree as far as I am informed.

It is believed it might be cultivated with success and with profit under different circumstances. At present scarcity of labor for this kind of business is the greatest drawback to the successful culture of this article, as I am informed. It is strange, too, that while laborers are said to be scarce the wages paid to all classes of labor are very low. As the negroes, who constitute the main part of the laboring population, can live and clothe themselves, as they are clothed, for very little, they have no desire to labor excepting to such an extent as to provide themselves, as a rule, for what is absolutely necessary. And, further, they seem to prefer the city with even less wages, on the whole, than the country, with more at the end of the year because of steady employment.

IMPORTATIONS.

There are no manufactures of India rubber in this consular district

The importation of rubber goods into this district is very limited. From statistics on this head, given me by the customs authorities, the importation for 1889 was as follows:

From Germany, 1,885 kilos; value, 4,970 milreis; duty, 2,386 milreis.

From United States, 80 kilos; value, 245 milreis; duty, 118 milreis.

From France, 1,110 kilos; value 5,680 milreis; duty, 2,777 milreis.

From England, 3,421 kilos; value, 8,580 milreis; duty, 4,118 milreis.

Portugal, 6 kilos; value, 7½ milreis; duty, 3½ milreis.

The above importation consisted of rubber coats, shoes, and boots, pipes or tubes, canes, combs, rubber for machinery—included in fact, every article of household use or wearing apparel into which rubber entered. Besides the above there were 17 kilos of celluloids, valued at 287 milreis, with a duty of 43 milreis, imported from France, and 84 kilos, valued at 1,126 milreis, with a duty of 169 milreis, imported from the United States during the same year. Am unable to obtain information as to the specific articles coming from the United States.

As may be observed, the whole value of the rubber manufactures imported is but a mere trifle. Coats, boots, and shoes of rubber are

a rarity. For the rainy season foreigners, as a rule, have a mackintosh, but rubbers rarely. Some Brazilians use a mackintosh also.

The entire value does not amount to 21,000 milreis for the year. For United States manufacturers to attempt to build up a trade in this line is, in my opinion, quite useless, for the chief reason that rubber goods for wear will never be used to any great extent in this country as long as the climate remains as it is.

For the nine months of the present year up to October 1 the value of the rubber goods or manufactures of rubber of all kinds imported amounted to 12,986 milreis only, which shows quite clearly it is a business not worth looking after.

As far as this district is concerned, the best thing for rubber manufacturers to do is to let this place entirely alone and seek to enter some field where rubber goods are wanted by the people. The statistics show there is no demand for this class of goods. The climate is against the wearing of such goods, excepting as stated—the lightest kind of rain coats—and these are chiefly confined to foreigners in their use.

Duty on imports.—The duty on imported manufactures of rubber runs from 600 reis per kilo, under the new tariff (this is the rate on rubber tubing) to 15 milreis per kilo on suspenders, suspensories, garters, elastics, etc., made with silk.

DAVID N. BURKE,
Consul.

UNITED STATES CONSULATE,
Bahia, November 25, 1890.

COLOMBIA.

BARRANQUILLA.

REPORT OF CONSUL NICKERS.

CRUDE RUBBER.

I have the honor to report that India rubber (*castilloa elastica* being the botanical name of the kind produced in Colombia) is a product of this district. The Magdalena River is more than 800 miles in length, and has a valley varying in width from 20 to 60 miles. One hundred miles from the mouth of the river the rubber tree abounds on either side, and for a thousand feet up the sides of the mountains. The rubber tree grows in great abundance along the banks of the San Jorge, the Cauca, the Nechi, the Le Brija, the Odon, the Carare, and the Cesar rivers.

Rubber (*castilloa elastica*) is yielded in Colombia by trees only; the rubber-producing vine is unknown, or at least not utilized, in this country for rubber. However, there are two varieties in the market here.

(1) That produced near the coast in the department of Bolivar and Antioquia, especially on the San Jorge River, of which the center of

trade is the town of Ayepel. This rubber is dark, mixed with sand and dirt, and needs to be pressed before it is shipped to the markets of America and Europe.

(2) That produced in the department of Tolima, in the interior of the country. This is yellowish, clean, and does not require to be pressed before shipment. It is superior to the coast rubber, and worth now in England 3*s.* to 3*s.* 3*d.* per pound. It is believed to be more carefully collected and prepared than the coast rubber.

GATHERING RUBBER.

The rubber tree grows in the tropical forests. The natives go into the woods on foot with their "machetes," carrying a small supply of food with them. They live in the forest from a few weeks to several months, according to the season of the year in which the trip is made; the sap running much more freely in the months of May and October, these months being the height of the rainy seasons. These gatherers during their stay in the forest support themselves by hunting game and gathering wild fruits and roots. They rarely carry with them either food or vessels for collecting the rubber, depending upon the forest to furnish both when they arrive at the place for their camp. They tap the trees, cutting them in this (V shape) and run the sap into troughs usually made of clay. Here in a short time it becomes thickened and solidifies in consequence of the evaporation of the liquid part. The natives then, in order to dry the rubber, take it from the trough and suspend it where the sun's rays can strike it gently. Sometimes it is exposed to a gentle fire instead. The juice has the consistency of cream, has a yellow color, and contains about 30 per cent of caoutchouc. When they have gathered as much as they can carry on their backs they carry it out to the nearest market, where it is bought for a little more than one-half what it brings in the Barranquilla market. It is then brought to Barranquilla, where it is prepared for the foreign market by pressing it.

Some years ago the natives used to cut down the tree, because the sap in this way ran more freely than from incisions as described; but the Government has now prohibited cutting it down, thereby preserving the tree, whose wound is healed in a few months after the incision is made, when it is ready again to send forth its blood for the arts of man.

I know of no American capital employed in the rubber trade in this district, either in gathering or otherwise. Merchants here buy and sell rubber as a part of their export business—no one making a specialty of rubber and no one, as far as I can learn, making any effort to increase or stimulate its product.

There is no export duty on rubber.

THE SUPPLY.

There is no fear expressed of the failure of the natural supply of rubber or the early decrease of the same. In my opinion, there is very

little prospect of a large increase in the supply as long as no effort is made by the manufacturers to displace the primitive methods used in this country in the gathering of rubber. The truth is, the supply of rubber in this part of the country is inexhaustible, but it needs some one to take hold of the industry and organize these natives into camps, as has been done by others, to increase the product of the hard woods in South America. These wood camps are usually managed by Americans, who select an elevated spot away from the malarial belt and build cheap shelters for the workmen.

If these native men had the modern appliances given them with which to tap the rubber tree, buckets to catch the juice as it flows from the tree, wooden troughs in which to dry the gum, proper food and shelter given them and a fair recompense for their labor (not a per diem, but a stated price per hundredweight), I am sure the supply of crude rubber could be increased far beyond any demand the world has for it to-day. But as long as the native Colombian is left to gather rubber in the present way and is paid for it a little more than one-half of what it is worth, there is not much inducement for him to increase the supply. It must be remembered that the population in the rubber districts is very small, but it is an easy matter to get men from other parts of the country if they are fed and paid properly. There is no place, I believe, in South America where the rubber gathering industry could be better carried on than from this port. The Magdalena is navigable for 800 miles, and its tributaries are also many of them navigable. Provisions for the men could be gotten easily and cheaply. The rubber could be gotten to this port with very little expense. That which is said of this region may be said also of the region west of this consulate. Camps ought to be organized in the Sinu River region as well as in the Atrato and Darien region. These three regions now furnish the chief supply of rubber that passes the consulate of Carthagena.

CULTURE OF THE RUBBER TREE.

I am informed by gentlemen who are familiar with the region of the San Jorge and Sinu rivers that the tree is cultivated there to some extent. I have myself seen trees which measured 18 inches in diameter. They grew from the seed and were cultivated for two or three years. They shoot up to an immense height before throwing off branches, and are not unlike the European ash in bark and foliage. I have no doubt the tree is susceptible of culture; but why cultivate, when millions of acres of forest are filled with it. It is a mistake to say that the rubber tree is being destroyed in this part of the world. There has been some increase in its product in the last three years, as is shown by tables appended.

I have seen no one who thinks that the cultivation of the rubber tree would be profitable for the reason given above.

RUBBER EXPORTS.

The following are tables from the custom-house statistics at Barranquilla, showing the weight and value of rubber exported from the port of Sabanilla, Republic of Colombia, during the years 1886, 1887, 1888, and 1889; showing also the places to which the same was shipped:

Year ending December 31, 1886.

London	packages..	82
Liverpool	do....	82
Havre	do....	44
Paris	do....	213
New York	do....	998
Total	do....	1,419
Weight	kilograms..	*85,140
Value		†$42,570

Year ending December 31, 1887.

London	packages....	1,286
Liverpool	do....	37
Havre	do....	171
Paris	do....	381
Bremen	do....	3
Hamburg	do....	54
New York	do....	1,334
Total	do....	3,266
Weight	kilograms..	*326,600
Value		†$81,650

Year ending December 31, 1888.

London	packages..	1,353
Havre	do....	283
Paris	do....	262
Hamburg	do....	10
New York	do....	1,582
Total	do....	3,490
Weight	kilograms..	*349,000
Value		†$87,250

Year ending December 31, 1889.

London	packages..	1,024
Havre	do....	193
Paris	do....	68
Hamburg	do....	75
New York	do....	1,283
Carthagena, Spain	do....	88
Total	do....	2,731
Weight	kilograms..	*273,100
Value		†$68,275

* Kilogram is in avoirdupois 2.2046 pounds.

† One dollar in United States gold is worth $2 of Colombian currency, gold not being in circulation.

IMPORTS OF RUBBER GOODS.

It is impossible to give value of importation, as requested. It would necessitate going over each invoice separately, and would delay the report too long. I give, however, the following table, showing the class of goods imported, the weight in kilograms, and from what places imported. This table covers the last eleven months, and is absolutely accurate according to the custom-house statistics, from which it has been compiled. The other questions under the head of "manufacturers of India rubber" are fully answered by saying there are no manufacturers of rubber in this country.

There is a duty of $1.25 per kilogram, gross weight, on imported rubber goods.

The merchants inform me that there is no material difference as to quality in the American and other imported rubber goods, each country excelling in the class which it makes.

JOHNSON NICKEUS,
Consul.

BARRANQUILLA, *December 12, 1890.*

IMPORTS OF RUBBER GOODS.

Statement of importations of rubber through the Barranquilla custom-house for the eleven months ending August 31, 1890.

From—	Class of goods.	Packages.	Weight.
	September, 1889.		*Kilos.*
New York...	Manufactured rubber, class not stated.....	4	181
	Rubber for machines ..	1	23
	Rubber shoes.....	2	152
	Rubber syringes.....	1	65
	Rubber hose.....	3	254
	Rubber combs.....	6	165
	Rubber seals.....	2	1
	Rubber nipples.....	3	125
	Total.....	22	966
Havre.....	Rubber springs.....	1	98
Paris.....	.....do.....	1	74
London.....	.....do.....	2	87
	Total for September.	26	1,225
	SUMMARY FOR SEPTEMBER.		
	Manufactured rubber..	4	181
	Rubber for machines ..	1	23
	Rubber shoes.....	2	152
	Rubber syringes.....	1	65
	Rubber hose.....	3	254
	Rubber combs.....	6	165
	Rubber springs.....	4	259
	Rubber seals.....	2	1
	Rubber nipples.....	3	125
		26	1,225

From—	Class of goods.	Packages.	Weight.
	October, 1889.		*Kilos.*
New York...	Manufactured rubber..	3	189
	Rubber packing.....	2	48
	Rubber hose.....	6	362
	Total.....	11	599
Paris.....	Rubber balls.....	2	158
	Rubber cuffs and collars	1	37
	Rubber combs.....	3	229
	Rubber springs.....	2	157
	Total.....	8	581
Manchester..	Rubber springs.....	1	80
	Rubber fine combs.....	1	79
	Total.....	2	159
Hamburg....	Rubber springs.....	3	225
	SUMMARY FOR OCTOBER.		
	Rubber balls.....	2	158
	Manufactured rubber..	3	189
	Rubber cuffs and collars	1	37
	Rubber packing.....	2	48
	Rubber hose.....	6	362
	Rubber combs.....	3	229
	Rubber fine combs.....	1	79
	Rubber springs.....	6	463
	Total.....	24	1,565

Statement of importations of rubber through the Barranquilla custom-house, etc.—Cont'd.

From—	Class of goods.	Packages.	Weight.
	November, 1889.		*Kilos.*
New York...	Rubber thimbles	1	1
	Rubber sheets	1	191
	Total	2	192
St. Nazaire...	Manufactured rubber	1	76
Paris	Rubber fine combs	2	161
Liverpool....	Rubber ribbons	1	73
	Rubber shoes	1	41
	Total	2	114
Hamburg....	Manufactured rubber	23	1,391
	Rubber combs	1	60
	Rubber springs	1	80
	Total	25	1,531
Bremen	Rubber combs	1	34
	SUMMARY FOR NOVEMBER.		
	Rubber, manufactured	24	1,467
	Rubber ribbons	1	73
	Rubber thimbles	1	1
	Rubber sheets	1	191
	Rubber combs	2	94
	Rubber fine combs	2	161
	Rubber springs	1	80
	Rubber shoes	1	41
	Total	33	2,108
	December, 1889.		
New York...	Rubber cord	1	16
	Rubber for machines	2	126
	Rubber stamps	3	58
	Rubber hose	2	80
	Rubber pouches	1	73
	Total	9	353
St. Nazaire..	Rubber, manufactured	1	36
Havre	Rubber tubes	4	185
Paris	Manufactured rubber	1	75
Manchester..	Rubber cloth	15	1,097
London	Rubber springs	1	13
Liverpool....	Rubber cloth	6	449
Hamburg....	Rubber balls	3	193
	Rubber combs	5	344
	Rubber shoes	1	67
	Total	9	604
	SUMMARY FOR DECEMBER.		
	Rubber balls	3	193
	Rubber cord	1	16
	Rubber, manufactured	2	111
	Rubber for machines	2	126
	Rubber stamps	3	58
	Rubber hose	2	80
	Rubber combs	5	344
	Rubber pouches	1	73
	Rubber springs	1	13
	Rubber tubes	4	185
	Rubber cloth	21	1,546
	Rubber shoes	1	67
	Total	46	2,812

From—	Class of goods.	Packages.	Weight.
	January, 1890.		*Kilos.*
New York...	Rubber, manufactured	2	128
	Rubber thread	1	75
	Total	3	203
Havre	Rubber shoes	1	78
Bordeaux....	Rubber springs	2	160
Paris	Rubber springs	3	203
	Rubber clothing	1	5
	Rubber cloth	6	476
	Total	10	684
Manchester..	Rubber manufactured	1	68
	Rubber cloth	34	2,595
	Total	35	2,663
London	Rubber cloth	2	150
	Rubber tubes	1	70
	Total	3	220
Liverpool....	Rubber cloth	2	148
Hamburg....	Rubber combs	6	423
	Rubber nipples	1	31
	Total	7	454
	SUMMARY FOR JANUARY.		
	Rubber manufactured	3	196
	Rubber thread	1	75
	Rubber combs	6	423
	Rubber springs	5	363
	Rubber clothing	1	5
	Rubber cloth	44	3,369
	Rubber nipples	1	31
	Rubber tubes	1	70
	Rubber shoes	1	78
	Total	63	4,610
	February, 1890.		
New York...	Rubber for machines	1	134
	Rubber springs	1	63
	Rubber shoes	3	191
	Total	5	388
Paris	Rubber cord	1	21
	Rubber combs	1	104
	Total	2	125
Manchester..	Rubber mouth pieces for musical instruments	5	335
	Rubber springs for shoes	1	49
	Rubber tubes	1	143
	Total	7	527
Hamburg....	Rubber, manufactured	8	584
	Rubber combs	1	80
	Rubber tucking combs	2	72
	Total	11	736

Statement of importations of rubber through the Barranquilla custom-house, etc.—Cont'd.

From—	Class of goods.	Packages.	Weight.
	SUMMARY FOR FEBRUARY.		
			Kilos.
	Rubber mouth pieces..	5	335
	Rubber for machines ..	1	134
	Rubber, manufactured.	8	584
	Rubber cord	1	21
	Rubber syringes.....	1	63
	Rubber tucking combs.	2	72
	Rubber combs	2	184
	Rubber springs for shoes	1	49
	Rubber tubes.....	1	143
	Rubber shoes.....	3	191
	Total	25	1,776
	March, 1890.		
New York...	Rubber syringes.....	2	114
	Rubber cloth	1	72
	Total	3	186
Paris	Rubber combs	1	75
	Rubber springs.....	1	79
	Rubber tubes.....	1	52
	Rubber cloth	2	103
	Total	5	309
Havre	Rubber elastics.....	1	64
	Rubber sheets	1	67
	Total	2	131
London.....	Rubber for machines ..	1	20
	Rubber combs	2	72
	Total	3	92
Liverpool....	Rubber cloth	5	382
Manchester..	Rubber springs.....	1	76
	Rubber cloth	21	1,604
	Total	22	1,680
Bordeaux....	Rubber combs	1	45
	Rubber cloth	2	216
	Total	3	261
Hamburg....	Rubber, manufactured.	1	52
	Rubber combs	3	173
	Rubber nipples.....	1	79
	Total	5	304
	SUMMARY FOR MARCH.		
	Rubber for machines ..	1	20
	Rubber manufactured .	1	52
	Rubber syringes.....	2	114
	Rubber elastics.....	1	64
	Rubber sheets	1	67
	Rubber combs	7	365
	Rubber springs.....	2	155
	Rubber cloth	31	2,377
	Rubber tubes.....	1	52
	Rubber nipples.....	1	79
	Total	48	3,345
	April, 1890.		
New York...	Rubber combs	2	144
Manchester..	Rubber, manufactured.	1	7
Liverpool....	*Rubber boots .....*	1	36
Paris	Rubber cuffs and collars	1	43
Bordeaux....	Rubber springs for shoes.....	1	42
Hamburg....	Rubber, manufactured	1	66
	Rubber combs	1	50
	Rubber springs for shoes.....	1	75
	Total	3	191
	SUMMARY FOR APRIL.		
	Rubber boots	1	36
	Rubber, manufactured .	2	73
	Rubber cuffs and collars.....	1	43
	Rubber combs	3	194
	Rubber springs for shoes.....	2	117
	Total	9	463
	May, 1890.		
New York...	Rubber, manufactured.	1	6
	Rubber seals	1	1
	Rubber shoes.....	1	48
	Total	3	55
Paris	Rubber shoes.....	1	64
	Rubber nipples.....	1	9
	Total from Paris..	2	73
Bordeaux ...	Rubber combs	2	149
	Rubber corks.....	1	20
	Total from Bordeaux.....	3	169
Liverpool....	Rubber cord	1	88
	SUMMARY FOR MAY.		
	Rubber cord	1	88
	Rubber, manufactured .	1	6
	Rubber shoes	1	64
	Rubber combs	2	149
	Rubber seals.....	1	1
	Rubber nipples	1	9
	Rubber corks	1	20
	Rubber shoes	1	48
	Total	9	385
	June, 1890.		
New York...	Rubber, manufactured.	3	110
	Rubber tubes.....	1	11
	Total	4	121
Birmingham.	Rubber elastic.....	1	19
	Rubber springs.....	1	73
	Total	2	92
Liverpool....	Rubber springs.....	1	71
London	Rubber springs.....	1	80
Manchester..	Rubber, manufactured.	3	186
	Rubber shoes.....	3	232
	Total	6	418

Statement of importations of rubber through the Barranquilla custom-house, etc.—Cont'd.

From—	Class of goods.	Packages.	Weight.
	June, 1890—Continued.		*Kilos.*
Paris	Rubber springs	1	68
	Rubber corks	1	26
	Total	2	94
Havre	Rubber, manufactured	1	82
	Rubber combs	3	158
	Total	4	240
	SUMMARY FOR JUNE.		
	Rubber, manufactured	7	378
	Rubber elastics	1	19
	Rubber combs	3	158
	Rubber springs	4	292
	Rubber corks	1	26
	Rubber tubes	1	11
	Rubber shoes	3	232
	Total	20	1,116
	July, 1890.		
New York	Rubber stamps	1	1
Paris	Rubber springs for shoes	5	410
Liverpool	*July, 1890*—Continued.		*Kilos.*
	Rubber cord	2	159
	Rubber cloth ponchos	1	120
	Total	3	279
Manchester	Rubber protectors for riders	6	477
	Rubber springs for shoes	3	214
	Total	9	691
Hamburg	Rubber combs	1	64
	Rubbers prings for shoes	1	82
	Total	2	146
	SUMMARY FOR JULY.		
	Rubber protectors for riders	6	477
	Rubber cord	2	159
	Rubber stamps	1	1
	Rubber combs	1	64
	Rubber cloth ponchos	1	120
	Rubber springs for shoes	9	706
	Total	20	1,527

CARTHAGENA.

REPORT BY CONSUL CROFT.

My residence in this country has not been sufficiently long to enable me to write from personal observation, but I have endeavored to obtain the information desired from gentlemen of intelligence who are natives of the country, and from those of long residence here who have been engaged in the business of collecting the crude rubber for exportation.

THE RUBBER TREES.

The rubber that yields the gum elastic is of three species, found in the mountains between the rivers Sinu, Atrato, San Jorge, and also in Cordilleras near the San Onofre.

That which grows in 3° and 4° north latitude is said to be the best.

GATHERING THE RUBBER.

The rubber hunters, before entering the forests, provide themselves with guns, ammunition, flour, salt, etc.

Arrived at a favorable place, a roof of palm leaves is quickly made, and every man starts out with his gun and machete, alone and in a separate direction, hunting for rubber and game.

As soon as one finds a rubber tree he clears a space around it, cutting away all vines, underbrush, etc., and proceeds on in quest of more,

not returning to camp until night. According to immemorial custom, a tree belongs to him who has cleared around it. They continue hunting for rubber in this way until all the trees near are secured. Then begins the work of gathering. A hole is dug in the ground near the grove; the bark of the tree is first hacked with a machete as high as a man can reach, the cuts being made in the form of a V and the milk collected as it exudes, and placed in the hole which has been prepared for it.

After the sap ceases to flow from the punctures made in the trunk, a pile of wood and brush is built at the foot of the tree, and the tree is cut down, the branches keeping one end of the tree clear of the ground and the pile of wood and brush doing the same for the butt.

The rubber hunter then carefully covers the ground beneath the tree with palm branches and large leaves and cuts gashes in the bark throughout its whole length, and the sap is scraped from the tree, and, with what has collected on the leaves underneath, is added to the milk already in the hole.

The sap when it first oozes from the tree is white as milk and about the consistency of cream, but upon exposure to light and air it soon becomes black if not properly watched and cared for.

The quantity of milk placed in one hole depends upon the distance from camp and the trail over which it is carried, as it is transported on the backs of natives.

As soon as the hole contains all the milk the hunter wishes, he coagulates it by adding some substance such as the root of the machocan, ye, hard soap, etc.

These substances cause the rubber to coagulate so quickly that the water, always present in fresh sap, is prevented from escaping, thereby causing the rubber to form a spongy mass, full of watery cells, and causes a great loss in weight when cut and pressed for exportation.

The loss in weight is much less when the milk is allowed to coagulate of itself without the use of any foreign substance.

On an average, about 40 pounds of rubber is obtained from each tree of average size.

After the rubber is properly coagulated it is cut into blocks of 100 to 150 pounds, strapped in bark and transported, on the backs of natives, to the nearest river town, where it is sold to the merchants and traders.

All the capital invested in the collecting of rubber is Colombian and but few are engaged in the trade, as the supply is growing smaller every day as the distance to procure it increases.

This is caused by the wholesale slaughter of this valuable tree.

EXPORT OF CRUDE RUBBER.

In the last few years the export to United States from the port of Carthagena has been:

Year.	To the United States.	
	Kilos.	Value.
1885	65,490	$50,215.92
1886	146,200	178,824.56
1887	136,115	156,760.25
1888	201,516	206,840.77
1889	115,441	100,284.50
Total	664,762	692,925.50

To Germany, during the years 1886 to 1889, 21,120 kilograms; to France, during the years 1886 to 1889, 19,760 kilograms; to England, during the years 1886 to 1889, 81,240 kilograms.

This shows a total of 786,882 kilograms of crude rubber and the value is approximated at $1 per kilogram.

CULTIVATING EXPERIMENTS.

Experiments have been made by a few enterprising Colombians in cultivating the tree, and there are several plantations upon the River Sinu which contain from ten to twenty thousand trees each, but as the orchards are but a few years old it can not as yet be proved to be a success.

The owners of the plantations are very highly pleased, and that would seem to indicate that the groves are not failures.

The tree germinates quickly and grows rapidly from the seed, and from my own experiments I have raised from the seeds vigorous and healthy plants 2 feet in height in two months, and I have seen a small plantation upon the Rio Sinu, four years old, raised from the seeds, and the trees measured 1 foot in diameter and over 20 feet in height.

I have been told that a tree ten years old will yield at least 20 pounds of rubber a year without retarding its growth.

From information I have received from reliable sources, and from my own personal observations on the upper Rio Sinu, I firmly believe that the rubber tree is susceptible of cultivation and that its culture would in the course of a few years be vastly profitable, requiring but a small outlay of capital to purchase and clear sufficient land for a grove of twenty thousand trees. A grove of that size well attended would amply repay the outlay and expenses with a splendid profit in addition.

The groves, once planted and grown, will last more than a man's lifetime, and the expenses attached will be those only of superintendence and collection.

Labor is very cheap and plentiful. All the necessities of life grow at the door almost spontaneously, and with the daily increasing demand for rubber in its many manufactured forms, and the daily decreasing supply of the crude rubber on account of the destruction of the rubber

forests, the question of cultivation becomes every day a more serious one.

I think it is necessary that some active steps be taken and at once to begin the cultivation on an extended scale and systematically, as in a few years more the supply of wild rubber will be exhausted.

I want to emphasize the facts that there are no climatic conditions in this country to hinder people from finding here a healthy home. Food in variety and plenty is to be had almost for the mere plucking. Game of all sort is in abundance, and the temperature of the country is even and comfortably cool.

I trust that in a short time some definite move will be made by our interested capitalists to cultivate the rubber tree.

C. I. CROFT,
Carthagena, Colombia.

UNITED STATES CONSULATE,
Carthagena, December 2, 1890.

COLON.

REPORT BY CONSUL SIMS.

THE RUBBER TREE.

Caoutchouc or India rubber is a natural product of the whole Isthmus of Panama, the trees growing in the forests to the height of about 40 feet and the diameter of 3 feet, and capable of yielding from 25 to 100 pounds of raw rubber per annum according to the size of the tree.

Rubber here is produced entirely from trees and not from vines.

I can not procure the botanical name for the trees, but know they are of two distinct kinds, though closely resembling each other in appearance, size, and yield. The white rubber is found chiefly on the Altantic side and the black rubber on the Pacific side of the isthmus; both are consided of equal value. The milk from the white rubber tree hardens more rapidly than that from the black, and the rubber retains the color of the milk, that is, remains white, while the milk from the black rubber tree, although perfectly white when it begins to flow, soon turns black from exposure to the atmosphere. I send samples showing the difference between the two kinds.

Rubber is gathered almost entirely by ignorant natives of mixed breed who continue to bleed the tree daily with fresh cuts until its life is destroyed; or they cut it down and thus more speedily secure all of the milk at once, allowing the milk in either case to flow out on the ground or in holes dug in the ground and harden by evaporation, sometimes assisted by mixing soap and vigorous stirring.

The few more intelligent gatherers bleed the trees once in six months or once a year, and catch the rubber in vessels prepared for the purpose, and thus keep it clean while it is being stirred and hardened.

I find a difference of opinion as to the length of life of the trees that are milked, some maintaining that a large tree will yield 75 pounds of rubber if judiciously tapped once a year, and will, if thus treated, live regular years of the trees, while others, who seem equally intelligent, put the life of the milked tree at only four or five years; the reasonable view seems to be that a tree will annually stand a reasonable milking (as the wounds heal in a few days) without impairing its health any more than it does that of the sugar maple in the United States.

A few thousand dollars have been invested by the Panama Plantation Company in clearing the undergrowth from the forest and planting 20,000 young rubber trees (now less than a year old), and it will cost probably $2,000 per annum to the company to clear out the undergrowth for six or seven years, until the young trees are large enough to be tapped. I can hear of no other investment of American capital, or any foreign capital either, in gathering or cultivating rubber. All merchants here buy from or barter with the natives for rubber, which brings from 25 to 60 cents per pound according to the care with which it has been gathered and manipulated.

My invoice books show thirty-seven consignments of rubber to United States ports from Colon during the year ending September 30, 1890. These consignments amounted in value in gold to $13,634.60. I have no means of ascertaining the number of pounds, but at the average price here suppose it was about 35,000 pounds.

I have been unable as yet to get the amount of rubber sent to other foreign countries, but am trying to do so. I think, however, most of the rubber produced here goes to the United States, almost all to New York.

The exports of crude rubber from Bocas del Toro from October 1, 1889, to October 1, 1890, amounted in value to $1,200, estimated at 3,300 pounds. I have no means of knowing how much was shipped from St. Andreas and San Blas (both within my district), as I hear that exports from both places go direct to the United States; they are nearer the rubber forests than Colon, and I estimate that their exports of rubber fully equal those from Colon and Bocas del Toro, making a total export from the Colon district of say $30,000 or about 80,000 pounds.

Nearly, if not quite, all of this rubber goes to the United States.

There is no export duty on rubber. The supply of rubber has already greatly decreased, as trees within 30 miles of Colon or Panama have practically been destroyed by means of improper usage; there is still a very large area of rubber forests from 40 to 150 miles distant, but the means of transportation prevents profitable rubber gathering, and these forests may escape until some better means of transportation are provided than native mules and small dugouts (or canoes). I can hear of no experiments in rubber cultivation except on the Panama plantation as before mentioned. This plantation is about 30 miles from Colon and about 15 miles from Panama.

It is not considered doubtful that the rubber trees can be successfully raised and profitably used here. The highest estimate here for cost of clearing and planting an acre of rubber trees is about $40; add the annual cost of keeping down the undergrowth (which is the only cultivation needed), $15 per annum for six years, and you will find that the total outlay will be $130 per acre in seven years, when the tree is ready to be tapped.

The lowest estimates for annual yield after seven years is 25 pounds of rubber per tree for 150 trees, or 3,750 pounds of rubber, worth 50 cents per pound, or $1,875 per acre. Deduct as a most liberal estimate $375 for cost of gathering and shipping from any point near the line of the Panama Railroad, and you have $1,500 per acre as the net annual profit on an investment of $130; but the popular estimate is that the annual yield would be much greater and that the profit would be $2,500 per acre.

Land can be had merely for the entering fees and survey, which would be about $250 for a thousand-acre tract.

RUBBER MANUFACTURES.

Rubber is not manufactured in this country.

All merchants here who deal in general merchandise import rubber goods, generally from the United States. It is impossible to state accurately the amount and value of rubber goods imported here, but it is estimated at not over $5,000 to $7,000 annually, nearly all from the United States.

No import duties are imposed on any foreign manufactures. Colon has a free port.

American rubber goods are regarded as the best that are imported here, and cheapest.

I have no suggestion to offer to American rubber manufacturers, as they already almost monopolize the market here, which is a very small market since the canal failure.

I inclose a communication from Mr. Walter J. Isaacs, an American citizen and a prominent merchant and banker here, who has for many years paid much attention to the rubber trade; and another from Mr. D. J. Mott, an American also, president of the Panama Plantation Company. Both these gentlemen have given me much aid, and Mr. Isaacs has kindly furnished a small rubber log which will show the method of tapping, and also two small samples, white and black, of rubber in its market condition here. This log and these samples I have sent to the Department by the Pacific mail steamer *Colon*, which sails for New York to-day.

W. E. SIMS,
Consul.

UNITED STATES CONSULATE,
Colon, November 5, 1890.

Mr. Isaacs to Consul Sims.

[Inclosure 1.]

SIR: Yours with India rubber circular from Department of State received, and I can assure you it will give me great pleasure to render you all the information that lays in my power.

In reference to the subject I shall state:

(1) A department of Panama, or from the coast of San Blas to the port of Colon on one side, and from a 60-mile distance (Miguel a Bordo) to Colon, abounds with rubber trees, the latter named is noted for its good "black rubber," which, before coming to market, goes through a manufacturing process, *i. e.*, the trees (which attain on an average 30 to 40 feet) are notched with a large knife or machete, in V shapes, so that the point of one V comes over the center of the next, and in this way the milk flows from one notch into another until it reaches the foot of the tree, where a small indentation or hole has been dug to receive same; if left there for three or four months it will coagulate by itself, but to quicken, soap is melted and in that condition mixed with milk in the hole, stirred rapidly until it comes to the consistency of putty; then left to harden, gradually allowing the water, which forms one-third part of the discharge from the tree, to evaporate.

By this manufacturing process it is clearly to be seen that sand or dirt may be mixed in so as to make the bulk heavier. A good tree of this description, which sometimes measures 36 inches in diameter, will produce at one notching or gathering, say 100 pounds of milk, which after being manufactured produces 150 pounds.

(2) The quality of this description of rubber wholly depends upon the amount of dirt it has accumulated during its handling, and amount of water contained; as clean, dry rubber, free from dirt or sand, which has had long enough time for the water to evaporate, is worth at this port 50 cents per pound, when, on the other hand, sand, stones, bark, etc., has been mixed, 60 per cent may be deducted.

(3) The opposite rubber district, from San Blas to this port, produces rubber which is commonly called "white," the tree of which is more or less like the "black," the only real difference between them (besides color) is, that the whole coagulates at once; if a bottle or receptacle of any kind be held under the notch to catch the milk it will harden and take shape; it needs absolutely no other handling or manufacturing process; worth at this port 50 to 60 cents per pound, and calculation must be taken for the great loss by evaporation, as this tree contains the same watery substance to the like amount as the "black;" 25 per cent may be reckoned as the minimum loss from evaporation.

The land upon which these trees grow is open and free, and may be had for cultivation and opening up by simply applying for same in the legal form set down by the laws of the country, without any further cost for land.

(4) The reason for the small quantities obtained is on account of bad or nearly noncommunication with the coast. Natives coming distances of 60 to 150 miles in small canoes (or dugouts), which prove in many cases disastrous to life or complete loss of labor in collecting rubber.

Experiments have been entered into by my knowledge by parties on the Isthmus to plant and cultivate the rubber plant which has met with fair results.

Thousands of miles of land are to be had full of these trees, already in prime and abundant in milk, simply for the asking and opening up of communication.

There is no duty or export of this article from this department, nor any expectations of same being levied; nor, sorry am I to say, no law to prevent the cutting down of trees for the quicker method of abstracting the milk.

In conclusion, the majority of manufactured rubber goods are imported from the United States of America in the shape of boots, shoes, coats, hats, tubing or hose, medical, stationery, and mechanical appliances to the amount of (from 1880 to 1885) $250,000, from that date, about $5,000 per annum.

There are no duties on the imports of the Isthmus.

Our American rubber goods in the line of stationery, mechanical, and medical appliances are considered of a superior grade compared with other countries.

Respectfully, yours,

WALTER L. ISAACS.

COLON, REPUBLIC OF COLOMBIA.

I send by bearer samples of the white and black rubber, also a piece of the body of the tree, 7 feet high, 9 inches in diameter, which, by tapping, you may easily see contains milk, although it has been cut some two weeks back.

I would judge this tree to be about 12 years old.

WALTER L. ISAACS.

Col. W. E. SIMS,
United States Consul at Colon.

Mr. Mott to Consul Sims.

[Inclosure 2.]

COLON, *October 24, 1890.*

DEAR SIR: In reply to your request for information concerning rubber, I can only deal with that portion of your circular which relates to the rubber in its wild or natural state, method of gathering, and the cultivation of the tree itself. Below are the answers to your questions in their regular order:

First. Caoutchouc, or India rubber, is a native production of Central and some parts of South America, the State of Panama, in particular, being considered to possess more than the other States of Central America and South America both the soil and climate necessary for its successful cultivation.

Second. It is yielded by trees.

Third. The milk is drawn from the tree in pretty much the same manner as the sap is taken from the maple in northern districts, different gatherers having different methods of cutting the notches, but the principle is to make the incision so that the milk or sap will flow free and easy into a vessel set to catch it. It is carried in the same vessel to the camp where it is put through a simple process which solidifies it, and by the same operation gives it any form or shape required. The morning is generally considered the best time to bleed the trees.

Fourth. Yes; though only a small amount.

Seventh. There is no fear of any failure from the yield of the rubber tree, but there is of the decrease of the natural supply from the destruction of the tree by improper bleeding, the laws of these countries giving the right of cutting the trees to those who may find them in the forests, without imposing any restrictions as to method, or as to quantity of milk to be drawn at one bleeding. The consequence is, that when a tree is found it is bled for all it is worth; all the milk it contains is taken out, which naturally results in killing the tree. A good healthy tree will last about four years with judicious bleeding, its length of life altogether depending upon the frequency of the bleeding and the quantity of the milk taken at one time. The trees can be bled every six months, but yearly bleeding gives better results.

Eighth and ninth. Very few experiments have been made in cultivating the rubber tree in Central America; none in this district that is known of outside of the Panama Plantation Company (O. B. Shaffer, secretary and treasurer). It is only lately, since the destruction of the rubber forests have told upon the market, that its cultivation has attracted attention. So far the efforts of the company have been very successful. About ten months ago they planted in the neighborhood of 20,000 rubber trees from six to eight months old. Very few, not exceeding 5 per cent, were lost in transplanting, the balance taking good root and shooting up very rapidly, all having to-day a strong, healthy appearance with every prospect of doing well.

The consumption of manufactures of rubber is, however, a very small item. The duties collected at the duty ports will, no doubt, be reported by the consuls at Carthagena and Barranquilla. American rubber goods are considered superior to those of European manufacture. American manufacturers of rubber goods, who wish to extend their trade here, should send their agents here to consult with dealers as to the demands of their customers in regard to the particular articles needed and the changes required to be made in weight, shape, and general style of goods.

THOMAS ADAMSON,
Consul-General.

UNITED STATES CONSULATE-GENERAL,
Panama, November 18, 1890.

PERUVIAN RUBBER FORESTS.

REPORT BY CONSUL KERBEY, OF PARA, BRAZIL.

The Peruvian rubber or cautcho forests are already fast disappearing, and the nearest are now far away. The practice of felling the tree to collect the rubber has destroyed all the trees near the rivers, except far up on the Ucayali and Javary rivers. It is affirmed that extensive tracts of forest have not yet been touched, but that they are difficult of access on account of the distance from the rivers and the lack of roads. It is perfectly safe to assert that in the near future all the available cautcho forests of Peru will have disappeared unless other methods are speedily adopted.

PERUVIAN RUBBER.

The rubber which comes from Peru, as well as that which comes from Bolivia, pays no duty in Brazil. In Peru it pays an export duty of 7 cents a kilo for first-class rubber, and 5 cents a kilo for inferior qualities. When it reaches Peru, of course it has to be transshipped for exportation. It can not be taken to a private warehouse without being classed as Brazilian rubber, and consequently paying duty. The usual procedure is as follows:

When the river steamer arrives with Peruvian rubber the consignees petition the custom-house authorities for permission to land the rubber and place it in the entrepot. It is taken to a special department of the custom-house, and there weighed and boxed. From there it goes to the ocean steamer under the eye of the official; but no charge is collected, as it is foreign produce in transit. If the consignees choose, they may transship directly from the river steamer to the ocean steamer without landing, and with the attendance of the Government official.

If this Peruvian rubber is sold in Para, the price paid is always the Para market price plus the amount of the Brazilian rubber duties, which it does not have to pay, and which is about 21 per cent ad valorem.

EXPORT DUTIES.

All rubber actually produced in the State of Para, and that which has not paid duty elsewhere, when exported from this port, pays a State export duty of 12 per cent ad valorem, a national export duty of 9 per cent, and 12 reis per kilo municipal tax.

Rubber produced in the State of Amazonas and exported from Para pays in Manaos or Itacoatiara a State export duty of 9 per cent to the State of Amazonas, and a municipal tax to the city of Manaos of 2 per cent ad valorem plus 15 reis per kilo. For fuller statistics with regard to the public revenue derived from rubber attention is called to the statistical statements that are soon to follow this partial report, and for which the necessary data are being gathered from official sources.

J. O. KERBEY,
Consul.

UNITED STATES CONSULATE,
Para, November 20, 1890.

its luxuriance, and dead roots and blasted branches testify to the fearful wrongs inflicted on the tree. However, it is when the wild tribes, with the customary improvidence of savages, attack the valuable rubber forests, cutting and slashing in the most outrageous manner, that the wholesale destruction begins. They slash all parts of the trees within reach, often felling them so as to render the operation of tapping more convenient. Scarcely anything can be more disheartening than the sight of hundreds of magnificent trees lying bleeding on the ground, their roots, trunks, and topmost branches covered with sickening gashes. Not infrequently these roving vandals set fire to forests, so that tender shrubs may spring up on which their flocks may feed. More often, along the banks of rivers and their swollen tributaries, they cut away the timber, so valuable while living, and float it down to be sold for the commonest of purposes.

Preservation.—It is a pleasure however to be able to say that the statement one frequently meets, that no effort is being made for the preservation of rubber trees is incorrect. Nothing is more interesting to observe than the untiring efforts of the British Government for the conservation of the forests and for the care of *Ficus elastica* plantations.

The immediate effect of the extension of English rule of course is the widespread devastation of forests, since the people just beyond the limit of restraint collect for the new market the caoutchouc in their destructive way; but once under the will of the new ruler their wasteful natures are curbed, and their ruinous practices to a great extent stopped. The protection of areas with naturally grown rubber trees on them is exceedingly difficult, on account of the well-nigh inaccessible localities where these trees grow, and because of the unequal way in which they are scattered over vast regions. Rubber is so very portable, its removal not being confined to roads or rivers, as with timber, that depredations on the forest preserves are of frequent occurrence. Vigilance never ceases, however, and new districts are constantly added to be watched over by the officials of the forest department.

In the single province of Bengal 11,468 square miles are under the control of these officers. One district in Assam, 8 by 30 miles, is said to contain 43,000 rubber trees, many of them more than 100 feet high.

Legitimate gathering.—The legitimate collection of rubber in the timber reserves is conducted under rigid restrictions. Fresh cuts are made only in February, March, and April, and the trees are allowed to rest for two years between each tapping. The cuts begin about 4 feet from the ground on the main stem alone, and are not less than 2 feet apart, and penetrate the bark only.

A European house adopted the plan of running the milk into wooden bins 6 feet square, partially filled with water, on which the rubber floats after a time. While the caoutchouc is still a liquid it is removed and boiled over a slow fire in iron pans 4 by 6 feet and 2 feet deep; two parts of water are added, and the whole is stirred constantly. When

coagulated the rubber is removed with iron forks, pressed, again boiled and pressed, sun dried, and washed over with lime.

Quality of rubber.—The rubber brought in from the region bordering on China is wretched-looking stuff, consisting of chunks resembling dark tufa or balls, 30 per cent of which is sand, bark, and clay. Many of the dirty stringy globes the natives have to sell remind one of a ball made by a thrifty mother of different sizes of twine that has been played with in the muddy streets by her scampish sons. These unscrupulous collectors always conceal a lump of mud in the center of the glutinous mass, imagining since it is sold nominally by weight, that their cheating has not been foreknown and provided for. The jungle people also mix with the produce of the *Ficus elastica* rubbers derived from two large creepers, the botanical names of which are *Chonemorpha macrophylla* and *Rhyncodia walichii.*

Planting the Ficus.—Recently the authorities have been spending large amounts of money and wisely directed effort in planting and raising the *Ficus elastica.* The British Government has come with the purpose of staying, and it can afford to wait for the large returns that are certain to be derived from its investments in plantations and forest reservations. It is a difficult thing to arrive at the truth in an investigation in regard to future productions, for those who know most differ widely in their judgment. Dr. George King, the superintendent of the Royal Botanic Garden, tells me that he "expects a decided increase in the rubber product within a reasonable period as the effect of the protection of rubber trees within British territory," while Mr. Gustav Mann, conservator of forests, informs me "that there is sure to be a decrease of the natural supply from this country." No practical scientists stand higher than these two gentlemen.

Be the results of forest protection and forest destruction what they may, the Government is using great precaution against the absolute ruin of the rubber industry, by starting *Ficus elactica* plantations in different parts of the country.

PLANTING AND CULTIVATING THE FICUS.

Sowing the Ficus seed.—The seed of this tree ripens from January to March, when it is collected as it falls, and dried in the sun. It is, properly speaking, the fruit, and consists of small figs the size of a pea. These, at the time of sowing, are broken between the hands, and the seed thus mixed with the particles of fruit is sown without any attempt to clean or separate the seed. About 75 seed are in one fig. Germination takes places sometimes only three months after the seed has been sown, and as it is very small, it is scattered on the surface of the soil only. It requires as much light as possible from above; side shade is an advantage. The seed is sown on beds, or in boxes or flowerpots, and it is most essential that the drainage of the soil be perfect and that the earth never becomes soaking wet; whilst on the other hand it is never allowed to become thoroughly dry, but is kept always moist.

	Cwt.
From Bengal	4,511
From Burmah	5,423
Total	9,934

Raw caoutchouc exported to United States for the years ending March 31, 1886-1890.

1885-'86	2,642
1886-'87	1,128
1887-'88	1,902
1888-'89	1,670
1889-'90	2,110

RUBBER IMPORTS.

Manufactured articles imported up to March 31, 1890.

Whence.	Value.	Into.	Value.
	Rupees.		*Rupees.*
United Kingdom	220,088	Bengal	45,966
Austria	5,261	Bombay	177,811
Germany	7,389	Sindh	9,008
Aden	4,563	Madras	5,592
Other countries	1,098	Burmah	6,022
	244,399		244,399

For the nine months ended December 31, 1890, 173,429 rupees.

MANUFACTURES.

There are no manufactories of rubber goods in India, and no American capital is employed either for rubber gathering or rubber trading in this country.

What few articles made in the United States are sold here come through England. The only things to be found that have been imported direct are the washers for rubber skates.

No rubber shoes are worn and very little clothing is sold except the poorest quality.

There is no export or import duty on either crude or manufactured rubber.

No American rubber manufacturer, desirous of extending his trade into India, ought to make any attempt unless he has abundance of capital and unless willing first to make a personal survey of the field.

SAMUEL MERRILL,
Consul-General.

UNITED STATES CONSULATE-GENERAL,
Calcutta, February 4, 1890.

EXPERIMENTS IN BURMAH.

REPORT BY CONSUL-GENERAL MERRILL, OF CALCUTTA.

Since forwarding my report last week Maj. C. T. Bingham, the conservator of forests in the Tenasserim Circle, Moulmein, has written me quite fully in regard to experiments made near Mergui, in Burmah, in introducing Hevea braziliensis, confirming some statements already in my possession but not used. It is quite possible that a selection from his communication, somewhat condensed, of whatever information has not been sent forward, may be of value.

In 1879 a large number of Hevea plants were set out on low ground in the plantation near Mergui. Only fifty survived the attacks of white ants and other enemies. The ten largest of these, 2 feet from the ground, measure in girth from 2 to 4 feet. The older trees having begun to bear seed, experiments were made, resulting so successfully that in 1887 there were on hand small and large 14,841 plants. The fifty older trees appear to be in perfect health, with evidence of such vigor as to leave no doubt that they are fully established and that the propagation and acclimatization of the Hevea braziliensis has been successfully demonstrated.

A tapping experiment was undertaken in 1888, during the month of July, under the impression that the flow of milk would be more abundant during the rainy season. Small bamboo pots were affixed to the tree by sharpening the upper ends and forcing them into the bark. The incisions were made in an upward direction and converging to the receptacle.

It was observed that the exudation of milk was greatest near the ground where the bark was thickest, while at a height of 6 or 7 feet it was almost nothing. Owing to continued wet weather it was found necessary to dry the milk over a fire and keep it subsequently in a warm place near the fire for about three weeks. The experiment was renewed between the 22d and 26th of November, when the rains had fully ceased, 42 trees being operated on, 5 to the west and 37 to the east of a small stream. Samples of this Hevea rubber were sent to the secretary of state, and replies were received from the Kew authorities and from the India-rubber works company.

LONDON, *July 4, 1889.*

From secretary of state for India to Government of India.

With reference to your letter No. 4 (forests), dated the 26th March last, the samples of caoutchouc obtained from Hevea braziliensis trees near Mergui, in Tenasserim, therein referred to, were duly forwarded to the director of the Royal Gardens, Kew, who transmitted them to the India Rubber, Gutta-Percha and Telegraph Works Company (Limited) for valuation and report.

It will be seen by the inclosed copy of a letter from Kew that Mr. Thiselton Dyer considers the results shown by the examination of the specimens very encouraging, and that experiments in tapping the trees of Hevea braziliensis should, if possible, be continued.

The prepared samples alluded to are forwarded separately per parcels post.

Caoutchouc does not appear to have been known as a product of Asia until 1798, when a plant afterwards named Urceola Elastica was discovered to yield it, by Mr. J. Howison, a surgeon of Penang (this consular district); since then, however, a large number of other plants have been found to yield it, chief of which are the *Willughbeias.*

The only section of this consular district in which India rubber is gathered and raised in any quantities is North Borneo (British), but just how much I have no way of ascertaining.

The Singapore table of imports for the quarter ending September 30, 1890, will give some idea of the India-rubber trade:

Imported from—	Piculs.	Value.
British North Borneo	4	$520
Java	2	110
Labuan	40	2,700
Other Dutch Islands	41	2,790
Sarawak	137	7,140
Selangor	2	100
Sumatra	8	700
Total	234	14,060

Borneo rubber (white in color).

	Piculs.	Value.
Dutch Islands	246	$14,460
Sarawac	211	9,360
Sumatra	4	360
Total	461	24,180

There is a royalty charged on rubber collected from the jungles of Borneo of 10 per cent ad valorem.

The different species of the plant found in the district are—

(1) "Manungan pulan," which comes chiefly from Northwest Borneo; it is a *Willughbeia Burbidgei*, and is specifically identical with the "Gutta-singgarip" of the Peninsula.

(2) "Maugan buyok," said to yield the best gutta of the Bornean forest; it is a *Leuconotis engenifolius;* this species is also found in small quantities on the peninsula.

(3) "Manugan manga," which yields very good gutta, is possibly a *Willughbeia*, as also probably is "Surapit," for the latter yields the same milky exudation as "Manungan pulan," but is said to be a bad gutta and seldom collected.

"Bertabu," or Petabo pulan, is referred to as of little value as gutta except, perhaps, for adulterating the better kinds. The other kinds of gutta met with in the Malay Peninsula are—

(1) Singgarip putch, or gutta sudek (*Parameria glandulifera*).

(2) Singgarip hitam (*Willughbeia Martabonica*).

(3) Gutta jelutong (dyera costulata); this is only used for adulterating.

The amount of India rubber exported to the United States direct (that is, through this consulate) during the years 1880 to 1889, inclusive, is as follows: 1880, 101 piculs; 1881, 146 piculs; 1882, 101 piculs; 1883 28 piculs; 1885, 25 piculs. Value of a picul varying from $50 to $130.

During the same period of years the largest shipment to the United Kingdom for any one year was 1883, 581 piculs; and the largest shipment to the continent of Europe during the same time was also in 1883, which was 586 piculs. The total amount of India rubber imported into the Straits in 1888, from all sources, was 13,227 piculs, valued at $697,298. Exports 13,715 piculs, valued at $547,786.

Experiments have been made in the cultivation of the rubber tree in Java, and it is now believed by such authority as I have that rubber is susceptible of cultivation, although I have no data on the subject. There is no export or import duty on rubber from this port, nor are there manufactories of rubber in this district. There are no imports of rubber goods from the United States, and no American capital invested here in its production.

GUTTA-PERCHA.

The gutta-percha production and export is much larger than the rubber (proper) trade, and I think may be considered in connection with this subject. The name is given to the inspissated juice, which is produced chiefly by *Dichopsis gutta*, called by the natives getah taban merah, and often confused with caoutchouc. The tree is of large size, from 4 to 5 feet in diameter, and from 100 to 200 feet in height. When growing in the forest it has a clean straight stem, and it may be generally distinguished by the rich brown color of the under surface of the leaves. Flowers small, white, and divided into six petals and six sepals. The seeds, generally two in each fruit, are oily, and are eaten by birds and monkeys. It flowers in March, and the fruit ripens in June.

The method of collecting the gutta is as follows: A tree having been selected is felled, and as it lies on the ground V-shaped rings, about 1 inch broad, are cut in the bark at intervals all along the whole length of the trunk and of the branches with a parang (Malay knife). These cuts soon become filled with the white cream-like sap, and in about half an hour the gutta will have separated from the aqueous portion of the sap and may be removed by rolling a small ball of it round in the cuts, to the edge of which the coagulated gum adheres and forms a disk, varying in size according to the number of scores it is rolled in.

These disks are then boiled in water and made into balls and sold by the collectors to the parties who export it to Singapore and Penang. The gutta is at first white, but soon changes to pink, and finally to a brownish red. The amount yielded by a single tree, about 100 feet high, and whose age was estimated to be over one hundred years, was 2 pounds 5 ounces of fairly clean gutta, valued by a Malay dealer at 3*s.* 3*d.* per pound. So that the product of such a tree is worth only 7*s.* 6*d.*

Other species of the gutta tree in the settlements are:

(1) Getah toban putch (white), *Dichopsis polyantha.*

(2) Getah toban sutra (silk), *Dichopsis sp.*

(3) Getah toban chayas (liquid), *Dichopsis sp.*

(4) Getah toban simpor, *Dichopsis maingayi.*

It is stated by the director of the botanical gardens here that there are over ninety-two species altogether on the peninsula.

The composition of gutta-percha is resolvable into resins albin and fluavil, and, like India rubber, is a hydrocarbon. It was first brought into use in 1884, and is now extensively used for telegraph cables. The amount exported from Singapore in 1888 was 23,717 piculs, valued at $1,112,478.

The amount exported to the United States alone for the quarter ending September 30, 1890, was 2,206 piculs, valued at $52,316. The export of gutta-percha, like the export of almost every article of commerce from the Straits Settlements to the United States, has been on the rapid increase. In 1880 it was only $190, which increased up to 1888 to $4,169, showing that the importation for the last quarter only has been more than for all the years from 1880 to 1888, inclusive, and I predict that the export of gutta-percha to the United States from this port direct for the year ending December 31, 1890, will be over $200,000. When I speak of exportations going "direct" to the United States I mean such goods as I invoice and so have account of. A large per cent of exports that are destined for American markets go via London and are so placed to the credit of the United Kingdom. It should be remembered, then, that in all computations and schedules that they represent but 75 per cent of our real export to the United States.

AMERICAN RUBBER GOODS.

In answer to inquiry as to what suggestions I would offer for the benefit of American rubber manufacturers desirous of extending their trade into my district, I can only reply that I see no reason why the American manufacturer should not compete with the English manufacturer in the sale of rubber goods here. There is no import or export duty on goods of any kind in this port.

Singapore is a city and island of 300,000 inhabitants, of whom I can safely estimate that 20,000 would be limited consumers of such goods. It rains here a little every day, thereby creating a demand for carriage tops, blankets, coats, and hats. For the benefit of those firms wishing to send samples of their goods I append the names of the following leading firms of Singapore with whom they could correspond:

Boustead & Co., Behn, Meyer & Co., Brandt & Co., Fisher, Huber & Co., Katz & Co., John Little & Co., Stiver & Co.

ROUNSEVELLE WILDMAN,
Consul.

UNITED STATES CONSULATE,
Singapore, December 7, 1890.

DUTCH EAST INDIA.

JAVA.

REPORT BY VICE-CONSUL BRENNING, OF BATAVIA.

India rubber is a product of some parts of Java, but in a limited quantity only. It is not yielded from vines but from trees.

The process of getting the rubber is by tapping the trees. The liquid so gained is exposed to the air, by which the watery part evaporates and the rubber substance remains.

There is, as far as I could ascertain, no American capital invested in Java for the cultivation of rubber trees.

The export of rubber from this island is very small. The export from Padang (Sumatra) is of more importance.

There is no export duty.

The produce is diminishing every year through natives recklessly overtapping the trees, which gradually die away.

Experiments of cultivation of the rubber tree are now made by the Netherlands India Government, and also on a small scale by some private landowners. The result is not fully known yet, because it takes about fifteen years before a tree can be tapped. It is believed, however, that the cultivation is susceptible and that culture will be profitable.

B. J. BRENNING,
Vice-Consul.

UNITED STATES CONSULATE,
Batavia, April 3, 1891.

SUMATRA.

REPORT BY VICE-CONSUL EILBRACHT, OF PADANG.

India rubber is found in this island, some in the neighborhood of Sumatra. The latter rubbers are partly brought to the Padang market, whilst a good deal is offered at Singapore and Batavia.

The better qualities are called India rubber (in Malay getah kadjei). The inferior sorts, getah gietan, are known under this name in the United States also.

The rubber is gathered by making holes in the trees, out of which the rubber flows in a liquid state. While exposed to the air it is gradually hardening.

As natives take little care of the trees after having made the holes, it frequently happens that rubber is flowing on the ground, and thus contains earth and pieces of wood from the bark of the tree to which it adhered.

Exporters have tried to convince the natives to adopt other methods of gathering the rubber, and to do it in the same way as it is done in Para, but the natives are unwilling to change their old manner of collecting even for a better one.

When the rubber comes to the hands of export firms here it is cleaned as much as possible by cutting the pieces and picking out the wood and dirt, but it is impossible by present methods to get a perfectly clean sort.

American capital is not employed in rubber gathering or rubber trading in this district.

The amounts of crude rubber exported from Padang during the years 1885, 1886, 1887, 1888, and 1889 were as follows, in piculs, respectively: 631, 4,104, 1,086, and 455.

The exports to the United States (New York) in 1890 amounted to 422 piculs.

There is no export duty on India rubber.

The collecting of the rubber is made in a rude way, many trees perishing by it, and as there is no provision made for cultivation or new planting, rubber must get more and more scarce.

Native people are still on a too low grade of civilization to permit successful experiment in the cultivation of rubber trees.

A. H. EILBRACHT,
Vice-Consul.

UNITED STATES CONSULATE,
Padang, December 22, 1890.

SIAM.

REPORT BY CONSUL-GENERAL CHILD, OF BANGKOK.

The rubber tree exists in small numbers in Siam, but no attempt has been made to collect the sap or to start the manufacture of rubber. Several parties have searched the country trying to find the tree in sufficiently large numbers to justify the starting of the industry, but they have invariably failed and the project has always been abandoned.

India rubber does not appear as an article of export or of import in the customs returns for Siam.

C. J. CHILD,
Consul-General.

UNITED STATES CONSULATE-GENERAL,
Bangkok, November 29, 1890.

GUTTA-PERCHA IN PHILIPPINES.

REPORT BY CONSUL WEBB, OF MANILA.

As far as is known to the department of forests and mountains of the Philippines, the caoutchouc or India-rubber tree is not found in the Philippine Archipelago; it is certain that India rubber has never been a product of this consular district. But it is quite probable that an exploration of the hitherto unexplored jungles of the southern

islands would result in the discovery of this valuable tree, for the climate and apparently the soil are favorable to its growth. There are portions of nearly all the islands which have never been explored by white men who were capable of recognizing the rubber tree, and if the natives have discovered it they have not learned its value. There is a widespread conviction that this archipelago will yet be made to yield many articles of commerce the existence of which is yet unknown here, for the whole vast country, with the exception of the environs of the three principal ports, Manila, Iloilo, and Zebu, is almost as completely wild and undeveloped as it was three hundred years ago. There are hundreds of square miles of jungle rich with botanical treasures that are never disturbed by human foot, black or white, and it will probably never be known what they really contain until the Spanish Government awakes to the advantage and necessity of removing some of the obstacles that stand in the way of immigration to the Philippines, and encourage American and English capital to come in and develop the country.

But it may be of interest to those engaged in the rubber trade to know that about fourteen months ago gutta-percha found its way to Manila and that it promises to take a prominent place among the exports. For several years the natives of Zamboanga, Jolo, and other southern islands have been sending the crude gutta-percha under the name of "goma," by sailing vessels, to Singapore, from whence it was shipped to England and it, apparently, never occurred to them that a market might be found for it in Manila until some enterprising Chinamen sent a consignment here, which was promptly sold at $12 per picul of 140 pounds. Since then the price has steadily advanced and gutta-percha is sold now at $34 per picul. Within the past year about 1,000 piculs have been received, all of which has been sent to England, and agents have been sent to Zamboanga and the Sooloo Islands by two English houses in Manila to endeavor to secure larger quantities than have yet been sent here. For the past four months the receipts have averaged about 100 piculs per month and four houses are now handling it instead of the one which received the first consignment.

Gutta-percha, as is generally known, is taken from the *Isonandra gutta* tree which belongs to the natural order *Sapotaceæ*. It reaches a height of from 60 to 70 feet, when it is usually 3 and 4 feet in diameter and is found in Borneo and some of the Pacific islands. Its existence in the Philippine Archipelago seems never to have been suspected until within the past few years, and until within the past year it has not been quoted among the exports from Manila.

The method of preparation for the market is, probably, that adopted by many of the partially civilized natives of Borneo, who unwisely cut down the tree in order to get the sap and thus steadily diminish the sources of supply But it is impossible to ascertain how the Philippine natives procure the gutta-percha, as nearly if not quite all that comes

to Manila now is sent from Zamboang by Chinamen who procure it by barter from the half savage Moros of that island. The latter bring it to the port from the deep jungles, into which they are, possibly, the only human beings who penetrate, and they are not disposed to impart, even to the Chinese buyers, the location of the trees nor the process of the preparation of the "goma." The gutta-percha comes to Manila in rolls or pillows weighing about 10 pounds each, and is a cork-like, light brown, odorless mass, streaked with white, which crumbles readily after the outside layer is broken. Dirt, leaves, and bits of bark are mixed with it, suggesting that the process of preparation is very primitive indeed. The Moros are not an industrious or provident class, and they are disposed to procure only sufficient gutta-percha to supply their temporary needs, which fact has caused the shipments to this port to be much smaller than they probably will be in the future if the Manila shippers succeed in encouraging a larger production. Now, that attention has been attracted to it as a profitable article for export, it is probable that an effort will be made to reach the sources of supply or induce the natives to bring in greater quantities. None has yet been sent to the United States.

The export duty is $1 per ton of 1,000 Spanish kilograms and 1 per cent ad valorem gross.

RUBBER GOODS.

No rubber goods are imported from the United States direct, although it is possible that some may come here by way of England. I have, however, been unable to find any American manufactures of this class and am told that nearly if not quite all the rubber toys, shoes, and clothing come from England and Germany. Still there are very few of this class of goods used owing to the warm climate, which admits of only the lightest clothing at all seasons of the year. A few rubber overcoats of English make are worn by coachmen during the rainy season, and rubber boots and shoes are very rarely seen. Linen hose and leather and linen belting are used almost exclusively.

The import duty on manufactured India rubber is 38½ cents per kilogram of 2.20 pounds, and for waterproof clothing and woven goods 68 cents.

In reply to the nineteenth question, I would say that the masses demand cheap goods of every kind, and that while the merchants generally admit that American manufactures as a rule are better than the class of products sent here by England and Germany, they are considered too good for this market. The natives are too poor to buy anything but the lowest grades of goods and the European residents, the majority of whom are here but a short time (from two to five years), generally come supplied with what they need in the way of fine clothing, send to Hongkong for it, or defer their purchases until their

return home, knowing that they can get the better classes of goods there at almost half the price demanded for them here. Very light cheap coats and cheap toys are probably the only rubber goods that would find a market here.

There is no rubber used here for manufacturing purposes.

ALEX. R. WEBB,
Consul.

UNITED STATES CONSULATE,
Manila, December 6, 1890.

CONTINENT OF AFRICA.

ST. PAUL DE LOANDO.

REPORT BY VICE-CONSUL BANNISTER.

THE RUBBER TREE AND VINE.

The India rubber tree and vine grow in immense numbers, both in the interior of this province and up as far as the oil rivers, say, from about 12° south to 5° north latitude. The production of this article for export is only of recent growth, very small quantities being shipped twenty years ago. The French in the colony of Gaboon were, I think, the pioneers in this trade, and it has extended, up to the present, north and south of that colony to the latitudes mentioned above, and there is every prospect of a further extension of production.

Rubber.—It is yielded by both trees and vines, the product of the former being greater in quantity and better in quality. The botanical names of the various trees and plants are unknown to me. According to a Portuguese dictionary, published in 1855 by Eduardo de Faria, the principal are the *Hevea caut-cheuc* and the *Jatropha elastica.*

GATHERING RUBBER.

The trees and vines are treated very ruthlessly by the natives. At first incisions are made in the stems, into which reeds are placed to draw off the milk-like liquid, which drains into gourds or other vessels suspended for the purpose of receiving the same; but as soon as it is apparent that no further supply is forthcoming from such incisions the plant is uprooted and the roots crushed to extract what remains. The gourds containing the liquid are placed in vessels containing water, which is heated to a boiling point, the liquid during this process being frequently mixed with sand, grass, twigs, etc.; when of a proper consistency it is taken out and rolled into balls. What are termed in the trade Loando niggers bring the best prices in the markets, as being better prepared and cleaner than most samples. The "fingers" of the Gaboon districts are about the commonest quality shipped from the coast.

THE RUBBER TRADE.

There is no American capital employed in the trade in this district. I doubt if Americans now care to enter into competition with Portuguese, English, French, and Germans along the coast, the facilities for

communication enjoyed by these countries being so great, coupled with the fact that each has more or less extensive colonies calling for regular intercourse with the mother country, that it is more than doubtful if it could be made to pay Americans with such odds against them. There is no doubt American goods such as cloth, hardware, machinery, lumber, furniture, tar, soap, provisions, etc., would, and in reality do, find a a ready sale, but for shipping the difficulty is to find homeward cargoes. The English and German steamers bring a little cargo to this port, but they seldom take any away. They fill up chiefly in the oil rivers and along the west coast. Nearly all rubber goes in Portuguese steamers to Lisbon from this province.

EXPORTS.

The quantities exported in 1889 from this district were as follows:

	Kilos.
From Mossamedes to Portugal	563
From Benguella to Portugal	1,065,217
From Benguella to other countries	44,700
From Novo Redondo to Portugal	268
From Loando to Portugal	587,608
From Loando to other countries:	21,551
From Ambriz to Portugal	3,709
From Ambriz to other countries	4,368
Total	1,727,984

The production of this article has increased enormously in the last few years. The export from the principal ports in 1884 was between 300,000 and 400,000 kilos; the export in 1889, as shown in the foregoing table, being nearly five times as great. From Benguela alone nearly three times as much was exported in 1889 as from the ports mentioned taken together in 1884. This carries us back to paragraph 3, where the matters concerning the mode of collecting and probable effect of same on future supply are treated. A new source of supply was discovered some three years ago in the district of Bihée. This is a tuber, something like a large potato in appearance, from which, I am informed, a good quality of rubber is produced. It must be found in immense quantities in the country, as it is to the discovery of this new supply that Benguela owes the enormous increase in its export in the year 1889 as compared with previous years.

The mode of treatment of this tuber to extract the rubber, as also its botanical name, are both at present unknown to me.

EXPORT DUTY.

There is an export duty of 3 per cent on produce shipped from Loanda, Benguela, and Mossamedes in Portuguese bottoms, and of 5 per cent on that shipped in vessels of other countries. There is no export duty on produce shipped from the port of Ambriz. The duty on rubber shipped from ports north of Ambriz, in the province, is 36 reis per kilo.

The revenue from export duties on rubber shipped from Loanda, Benguela, and Mossamedes in the year 1890 amounted to reis, 32,464,000, or $35,061. As no statistics have as yet been published relating to ports north of Ambriz, I can not give the quantities shipped nor amount of revenue collected at such ports. The quantity, however, must have been some hundreds of tons during 1890.

DESTRUCTION OF THE RUBBER TREE.

There is a feeling abroad that unless means are adopted to put a stop to the present mode of gathering rubber the supply, sooner or later, must receive a serious check. As, however, there seems to be an almost unlimited number of trees and plants in the vast territories inland, and the collection of the rubber is entirely in the hands of the savages of the interior, no one considers himself called upon to interfere with the present process.

CULTIVATION OF THE RUBBER TREE.

I have no knowledge of any attempt having been made to cultivate the trees or plants.

That the tree, plant, or vine could be cultivated I have reason to believe. That the cultivation would prove profitable at present I doubt very much, for the reason stated in paragraph No. 7 as to supply, and the scarcity of labor that would necessarily be required.

MANUFACTURES.

As to "manufactures of India rubber" I have only to say that there is a very limited demand indeed here for the manufactured article, which takes the form of packing for machinery, waterproof coats, etc. The value imported is not specified in the statistics published. I do not think it exceed in twelve months $100 to $200.

ED. BANNISTER,
Vice-Consul.

UNITED STATES CONSULATE,
Loanda, April 29, 1891.

ZANZIBAR.

REPORT BY CONSUL ROPES.

Replies to circulars are restricted by the fact that no statistics are procurable from the authorities of the port, and estimates and information can only be obtained from private sources, excepting the direct rubber trade with the United States, which, of course, is kept in consular records.

Rubber is yielded by trees in this district, but botanical names are unknown.

The trees are gashed and the juice collected in gourds for the first quality rubber. When slightly thickened so as to become stringy it is

wound into balls from 1 to 3 inches in diameter, and usually a little bark and sand is introduced. This collection is made by the negroes living in the rubber district on the coast south of the island of Zanzibar. After a small quantity has been collected the native carries it down to some one of the small coast towns and sells it, usually to a British Indian trader, who ships it to Zanzibar for foreign sale and export.

If the natives were content with taking merely the juice of the tree for the first quality of rubber we should have a much better article and not be in danger of the extermination of the rubber tree on this coast, which we are now threatened with; but after allowing all the juice to run that will they cut down the trees and pound the wood until all the sap is extracted. This produces a very inferior kind, mixed with bark and dirt, and of course destroys the tree and all hope of another yield.

No American capital is employed in gathering rubber, nor to my knowledge has any organized European or Indian attempts ever been made to gather rubber or protect the trees.

The most of the rubber district is now under the rule of the German and British East African companies, and it is hoped that some measure will be taken to these ends shortly.

The best estimates for an average of the total exports from the Zanzibar rubber district under ordinary conditions would be about 700,000 pounds per annum, but during the coast wars of the past two years the production has been reduced to one-third. It is stated that this rubber district, under proper European supervision, can yield annually many times this amount, and of course all trees would be preserved. Rubber is consigned principally to London and Hamburg. Exports to the United States direct are insignificant, amounting during the year 1889 to only 25,900 pounds, valued at $11,457.88.

An average year would be about three times this amount. Much of this rubber goes to the United States via London.

An export duty of 15 per cent on the market price in Zanzibar is charged.

As mentioned before, the mode of collecting rubber in operation at present threatens the total extermination of the tree, but the amount of rubber collected and trees destroyed is so small in proportion to the number of trees, as stated by travelers, natives, and others, that we hope the cutting-down practice will be checked before the tree is exterminated.

No experiments in the cultivation of trees, vines, or plants have been made here to my knowledge.

I can obtain no information regarding probable results of cultivating rubber trees in this district. There appears to be enough trees and the rubber itself is said to be of good quality. With proper care of trees and Para methods of gathering, I feel sure that the most satisfactory results both as to quality and quantity would be obtained.

There are no manufactures of rubber imported or manufactured in this district.

Crude rubber imported here from a foreign country would pay 5 per cent duty.

Foreign manufactures would pay 5 per cent duty.

E. D. ROPES, Jr.,
Consul.

UNITED STATES CONSULATE,
Zanzibar, December 1, 1890.

AUSTRALASIA.

NEW SOUTH WALES.

REPORT BY CONSUL GRIFFIN, OF SYDNEY.

RUBBER TREES.

There is no India rubber manufactured in Australia. The few trees and plants that produce caoutchouc in New South Wales are of little commercial value. Mr. J. H. Maiden, F. L. S., F. C. S., curator of the Technological Museum, Sydney, who has given much attention to the useful plants of Australia, is of opinion that India rubber trees are essentially tropical, and that the species cultivated in New South Wales for experimental purposes are short-lived and, even under the most favorable circumstances, have a precarious existence. The plants, he says, fare better in Queensland and other tropical parts of Australia.

In New South Wales there are several native fig trees, notably *Ficus rubiginosa*, the Port Jackson fig, and *Ficus macrophycea*, the Morton Bay fig. The milky sap of these trees contains caoutchouc or India rubber, but the percentage is small, and up to the present it remains a curiosity of the laboratory. It seems as if a tropical heat is necessary for the formation of this product.

Mr. F. Turner, F. R. G. S., the government botanist of New South Wales, to whom I am indebted for valuable information on this subject, says that "there is a great future for the India-rubber trees in northern Australia."

Experiments have been made both on exotic and indigenous trees. The species of fig (*Ficus macrophylla*, Desf.) which are closely allied to the "Assam rubber" tree of India (*Ficus elastica*, Rox.) yield a very fair caoutchouc, and parties were collecting the sap at a place called Coomera, in southern Queensland, a few years ago. This tree is found growing abundantly in New South Wales and Queensland. It is easily propagated by seed. Another species of fig (*Ficus rubiginosa*, Desf.), which is also indigenous to New South Wales and Queensland, yields a caoutchouc, and it formed the subject of the following chemical investigation by Warren de la Rue and Hugh Miller in Watts' Dictionary, II, 646:

The resinous exudation resemblese uphorbium in appearance; varies in color from dirty red to almost white solid, generally brittle, but tough in the interior of large pieces; opaque, with dull and wax-like fracture; at 30° C. it soften, and becomes plastic like gutta-percha, but not so sticky, provided it has been previously wetted in water. In its natural state it has neither taste nor odor, but evolves an odor like that of wax when heated, and evinces a characteristic taste on being masticated. It is quite insoluble in water, either hot or cold. The greater part of it is soluble in cold alcohol, and a considerable portion of the remainder in hot alcohol, and by treating it with these solvents in succession it may be separated into the following constituents:

	Per cent.
Resinous substance sycoretin, easily soluble in cold alcohol	73
White crystalline substances chiefly acetate of sycoceryl, C_2, H_3, O, C_9, H_{29}, O, insoluble in cold but soluble in warm alcohol	14
Caoutchouc, fragments of bark, sand and loss	13

Mr. W. Hill, late colonial botanist of Queensland, when giving evidence before a select committee of the legislative assembly on Forest Conservancy, said, in answer to a question put by the chairman (the Hon. John Douglas), "Is there any probability of a good India rubber tree being discovered on our northern coasts?"

"I have not the least doubt that some of the fig trees on the Daintree and Johnston rivers will produce a good deal of India rubber." In a report which the colonial botanist furnished to the same committee on forest resources of Queensland, he says, "The fig tree reserves in the north would make excellent places for the acclimatization of such trees as the bottle India-rubber tree (*Siphonia elastica*), and the gutta-percha plant (*Isonandra gutta*), as I am convinced that they would flourish admirably there."

The exotic India rubber yielding trees and vines that are at present growing in Australia are, the Assam rubber tree (*Ficus elastica*, Rox.), which grows rapidly in the costal districts of New South Wales and Queensland. It is easily propagated by seeds and cuttings. Mr. Turner says:

The Ceara rubber tree (*Manihot glazioni*, Muell.) was introduced and produced flowers in the botanic gardens, Brisbane, as far back as 1867. Good samples of rubber have been taken from this tree and exhibited among other economic products that were prepared at the botanic gardens, Brisbane, at the intercolonial exhibitions. The last time I saw this tree it was about 25 feet high, and as it will thrive on very poor dry soils it is one of the most valuable India rubber producing trees that has been introduced into Australia.

The West Indian rubber plant (*Castilloa elastica*, Cerv.) has been introduced and propagated, but the tree has not been long enough in the country to know what district is suited to its growth.

The India rubber vine (*Cryptostegia grandiflora*, R. Br.) grows exceedingly well in southern Queensland and produces both flowers and seeds; from the latter it is easily propagated.

The Para rubber tree (*Herea braziliensis*, Muell.) has also been introduced and propagated, but the tree has not been long enough in the country to know what district it will flourish in—that is, the most southern limit.

The African rubber vine (*Landolphia florida*, Benth.) is also growing in Australia, but it has not been long enough in the country to know what district it will flourish in.

Mr. Turner does not doubt that the systematic cultivation of rubber-producing trees in suitable localities would be a paying undertaking. He says:

> It should be born in mind that the caoutchouc can not be obtained from the trees all the year round, only at stated periods to make it a success as a commercial undertaking.

He recommends that other crops of commercial value should be cultivated in the vicinity of India rubber reserves, as they could be harvested at times when the rubber was not in a fit state to collect. This he thinks would make the undertaking a most profitable one.

IMPORTS AND EXPORTS.

The value of India rubber goods imported into New South Wales for the year 1890 was £32,012 ($155,786) against £24,594 ($119,686) for 1888. These amounts, however, do not represent anything like the value of the imports, as many articles, such as rubber clothing, cushions, boots and shoes, are entered under the headings of drapery and boots and shoes. The articles described in the customs returns as India rubber includes, principally, garden hose, belting, tubing, valves, washers, packing for locomotives, etc. There is no way of ascertaining the quantity and value of each particular kind of goods.

The India rubber trade has increased since 1887, when the value of the imports was only £9,059 ($44,085.)

The subjoined table shows the value of the imports of india-rubber goods into New South Wales for each year from 1885 to 1890, inclusive:

Year.	Value.	Year.	Value.
1885	$103,009	1888	$84,6[illegible]
1886	79,706	1889	119,6[illegible]
1887	44,085	1890	155,7[illegible]

Small quantities of these goods are reëxported to the other colonies.

The subjoined table shows the quantity and value of these reëxports from New South Wales for each year from 1885 to 1889:

Year.	Packages.	Value.
1885	76	$4,9[illegible]
1886	164	4,0[illegible]
1887	105	7,3[illegible]
1888	178	10,4[illegible]
1889	223	13,0[illegible]

These exports, as in the case of the imports, do not include India-rubber clothing or wearing apparel—such as cloaks, coats, leggings, and boots and shoes. There is only a very small demand for rubber overshoes, on account of the mild climate in Australia. A few articles of this kind find their way to the southern parts of New Zealand, where there is snow

in the winter, but, as a general rule, the seasons are not severe enough to cause any great demand for such goods. The frequent rains, however, require the use of India rubber and other waterproof clothing. There is also a small demand for India-rubber boots and leggings in the seaport towns and in the mining districts. The bulk of the India-rubber goods used here comes from Great Britain. The value of the imports from that country in 1890 was £24,318 ($118,343), while only £783 ($3,815) came from the United States.

I append hereto a table showing the quantity and value of India-rubber goods imported into New South Wales in each year from 1888 to 1890, with the names of the countries whence imported:

Whence.	1888.		1889.		1890.	
	Packages.	Value.	Packages.	Value.	Packages.	Value.
Great Britain	313	$49,564	503	$78,963	724	$118,342
United States	115	7,897	79	4,569	101	3,810
France	7	1,100	6	949	2	78
Germany	129	12,097	150	15,158	111	11,800
Belgium	3	486	3	340	3	374
Australian colonies	213	13,494	280	19,704	321	21,377

It will be noticed in the preceding tables that some of these imports are set down to the other Australian colonies, but it should be understood that they were not manufactured in those colonies, but were only sent from England and reshipped to this colony. It will also be noticed that while England increased the value of her direct shipments from £10,185 ($49,566) in 1888 to £24,318 ($118,344) in 1890, that the shipments from the United States decreased during the same periods from £1,623 ($8,019) to $783 ($3,815). The extent of the direct imports of India-rubber goods into New South Wales from the United States will be best shown by the following table, giving the quantity and value of the imports for each year from 1884 to 1890:

Year.	Packages.	Value.	Year.	Packages.	Value.
1884	64	$4,890	1888	115	$7,897
1885	75	3,820	1889	79	4,569
1886	78	6,258	1890	101	3,810
1887	75	3,507			

AMERICAN VS. ENGLISH GOODS.

I have had several interviews with members of leading firms here engaged in the india-rubber trade for the purpose of ascertaining the reason of the small shipments from the United States, but have been informed in each instance that the English had the trade and could furnish a better quality of goods at a lower price than the American manufacturer. In one article, however, that of medium-quality garden hose, it was admitted the Americans could undersell the English. One

merchant states that in regard to American India-rubber goods in general, if the quality was right the price was too high, and when the price was right the goods were inferior. Another firm stated that no objection was made to the quality, but only to the price. The manager of the Sydney branch of a New York firm informs me that he has been obliged to return all India-rubber goods consigned to him from New York last year, including several consignments of hose, belting, gum boots and shoes, carriage and wagon spring bumpers, etc., for the reason that the prices were entirely too high and that it would entail less loss on his firm to return the goods to the United States and pay freight and all other charges connected with their shipment than to sell them here.

He attributed the low prices of India-rubber goods in Australia to the large stocks in hand of the manufactures of the North British India Rubber Company. This firm, he said, has almost a monopoly of the trade and will not stand any rivalry. Considerable quantities of the manufactures of The India Rubber, Gutta Percha and Telegraph Works Company of Silvertown, England, are sold in this market. These include sheet rubber, valves, washers, tires, tubing, packing, garden and delivery hose, suction and high-pressure steam hose, waterproof garments, rugs, rubber and canvas belting, etc. The prices of these goods are about the same as those of the North British India Rubber Company, but it is said that the latter company have the run of the trade and have their goods more generally distributed among the principal stores and shops

The Sydney agent of The India Rubber, Gutta Percha and Telegraph Works Company states that he has on several occasions endeavored to introduce American India-rubber goods into the Australian market, but each attempt proved a failure, principally on account of their high cost, although no fault was found with their quality, except that they were usually lighter in weight and did not appear to be as strong and durable as the English goods. The Messrs. Perdrian & Co., of Sydney, claim to be the largest importers of American India-rubber goods in New South Wales, and they inform me that the value of their imports from the United States during 1890 was about £5,000 ($24,333). These imports consisted chiefly of rubber boots and shoes, and mechanical and druggists' India-rubber goods. They state—

There is a prejudice against American rubber goods, and the so-called "pure sheet" mentioned in American price lists does not at all compare with the same article of English manufacture. Also the American rubber boots and shoes (unless they are the very best grades) do not compare with British goods. We may mention that there is the same feeling against German and French goods, all of which perish much earlier than English goods.

There have repeatedly been agents sent out here from America (as also of course from other parts of the world) representing American rubber manufacturers, carrying samples and small stocks of their goods. These do not seem to have done much and the stocks have almost without exception been offered and bought by us at our own prices.

It is very generally admitted, however, that while the English and European goods have the advantage of lower prices the American articles are superior in both quality and style, and it is well known that they have carried off the prizes at international exhibitions whenever brought into competition with English and other European manufactures. In goods for the use of ladies the Americans have so far distanced all competitors that comparison is out of the question. If a stylish and well-fitting India-rubber cloak or garment of any kind is seen it is almost sure to be of American manufacture, and no one would ever think of attributing the origin of a clumsy, ill-shapen garment to the United States.

TRADE OBSTACLES.

Nearly all kinds of India-rubber clothing can be obtained at low prices in the United States, and the chief reasons that so few of these goods are sold here is that nearly 90 per cent of the whole of the foreign trade of the colonies is enjoyed by Great Britain. In the first place there is a direct medium of exchange with London and none with the United States. In fact the bulk of the business transactions with the United States is paid in drafts on London. The few banks in Australia that sell exchange on the United States charge three or four times as much as on London, and if a draft on New York or on any other large city of the United States is sold here the rates are usually from 2½ to 5 per cent, but even when such a draft is purchased it is only for a small amount. The present inconvenient system of banking between the United States and Australia was explained at length in my reports entitled "Cotton textiles in New South Wales," and "The Australasian and American trade." (See No. 118, Consular Reports, July, 1890.)

CUSTOMS DUTIES.

There are no duties charged on India-rubber goods imported into New South Wales, and the kinds entered under the heads of drapery, boots and shoes, etc., are also admitted free.

Many articles of India-rubber manufacture are also admitted free of duty into Victoria, such as boot elastic, washers, India-rubber bottles, stamps, erasers, buffers, tires, hose, and tubing. An ad valorem duty, however, of 25 per cent is charged on India-rubber clothing mixed with cotton, wool, or silk. India-rubber goods of all kinds pay an ad valorem duty of 15 per cent in Queensland and also in New Zealand, and 12½ per cent in Tasmania and West Australia, while they are admitted free into South Australia.

EXPANSION OF THE TRADE.

One of the difficulties with which the importer of American goods labors under is the absence of a knowledge of the condition of the American market. The latest intelligence as to that market is by the San Francisco mail steamers, which arrive in Sydney once every twenty-

eight days. Sometimes upon their arrival at Auckland, New Zealand, the prices of leading articles are cabled from there to Sydney, which brings the intelligence four days earlier, but cablegrams from the United States to the Associated Press, showing changes in American markets, are unknown here; while on the other hand the newspaper press publish daily all changes in the London market. These cablegrams are posted up in the stock exchange and other places throughout the colonies where they can be read by anyone interested, but information as to the American markets can only be acquired by private messages, which of course entail a heavy expense on those sending or receiving them. Nor is the exporter in the United States any better posted as the condition of the Australian market. The cost of a private cablegram from New York to Sydney is 10*s.* 6*d.* ($2.56) per word, and from San Francisco to Sydney 11*s.* ($2.68), and the cost of a message from London to Sydney is 24 cents less. Merchants here seldom have occasion to cable for information as to changes in the London market, as they are made known, as previously stated, in the public press. The great volume of trade between England and Australia very naturally tends to facilitate all kinds of business transactions.

There is at present considerable agitation, not only for the reduction of the cable rates but for additional cable communication, as present means of communication are not unfrequently interrupted through volcanic convulsions, and on several occasions there has been a complete break in all cable communication for several weeks at a time. At present there are two routes available for telegraphing with England and thence across the Atlantic to the United States. One is by submarine cable via Suez and Falmouth and the other via Persia. The facilities, however, for cabling are deemed insufficient and they will doubtless be improved. The American merchant will, of course, reap the advantage of a reduction of rates as well as the English, but there ought to be direct communication between here and San Francisco, as the distance will be many thousand miles shorter than by either of the present routes, and not only would materially lessen the cost but be the means of bringing the United States and Australia into closer business and other relations than at present exist between the two countries. Competent navigators have furnished the following statement of the distances between the United States and the Australasian colonies, namely: From San Francisco to Honolulu, say, 2,100 miles; Honolulu to Tutuila, say, 2,271 miles; Tutulia to North Cape, New Zealand, say, 1,700 miles; allow for slack and irregularities of the ocean bottom, say, 5 per cent, 300 miles; total, 6,371 miles.

As an alternate route other distances are furnished, viz: San Francisco to Honolulu, say, 2,100 miles; Honolulu to Tutuila, say, 2,271 miles; Tutuila to New Caledonia, say, 1,400; New Caledonia to Brisbane, say, 800 miles; allow for slack and irregularities of ocean bottom, say, 328 miles; total, 6,899 miles.

The line via the North Cape of New Zealand would meet with the New Zealand system, which is connected by cable at Cooks Straits to the southern end of Van Diemans Land. The route via New Caledonia would connect with the Australian system at Brisbane.

There are no serious obstacles in the way, as surveys and soundings have been made showing the practicability of a Pacific cable route.

The following estimates have been made as to the cost of construction of a cable from San Francisco to New Zealand, via Honolulu and Tutuila: 5,000 miles deep-sea cable, at $1,000, $5,000,000; 800 miles intermediate cable, at $2,000, $1,600,000; 570 miles shore-end cable, at $3,500, $1,995,000.

The cost at London of the cables alone would be, therefore, 6,370 miles, $8,595,000; depositing on bottom, landings, franchises, concessions, and contingent expenses, $1,405,000. Total, $10,000,000.

It is reported that an English syndicate has been formed for the construction of a cable between Vancouver's Island and Australia and that the stock is being rapidly subscribed. This movement is said to be part of a plan of the Canadian Pacific Railway for pushing the trade between Canada and Australasia in connection with a line of fleet steamers between various colonial ports and Vancouver's Island. A subsidy for this service has already been voted by the Canadian legislature. With the view of fostering the trade with these colonies, Canada has removed the duties on wool. The American merchant, however, has very little to fear from the efforts of the Canadians to divert that portion of the Australian trade enjoyed by the United States, for the few articles that the Canadians manufacture do not at all enter into competition with the American ones; and as to the removal of the duties on wool, that, at the most, will be of little advantage to the Canadians, as Canada is too thinly populated and her manufacturing facilities are too limited to offer inducements for a market for wool or any other raw product of Australia.

The Australasians feel that they have a just cause of complaint against the United States for withholding from them for so long a period assistance in the way of subsidizing a mail steamship line between San Francisco and the colonial ports.

For many years the cost of the mail service has been wholly borne by these colonies, and New South Wales continued to contribute toward it long after it ceased to be of any advantage to her in the way of a quick transit of the mails to London, and the only plea for the continuation of the subsidy was the encouragement it gave to the commercial and friendly relations between the two countries. It should be mentioned, however, that the United States postal authorities have lately contributed toward the service, but the amount is very small compared with that borne by the governments of New South Wales and New Zealand; but the disposition lately shown by the United States to still further assist the line, so as to secure a faster and more frequent service, has

done much to remove the grounds for complaint. It has also been noticed ehre that, while the United States customs duties have been increased on certain grades of wool, no increase has been made on the kinds usually imported from Australasia.

COST OF FREIGHT.

The cost of freight on india-rubber goods from New York to Sydney by sailing vessels is 25*s.* ($6.08) per ton, cubic measurement, the cost differing very little from that from London to Sydney. Should, however, goods be sent here by steamer via London the cost would be 50*s.* ($12.16) to 65*s.* ($15.82) per ton. These rates vary from time to time, according to the demand for freights; but the average cost during the year would perhaps be a little less than the figures given.

G. W. GRIFFIN,
Consul.

CONSULATE OF THE UNITED STATES,
Sydney, February 7, 1890.

NEWCASTLE.

REPORT BY COMMERCIAL AGENT BAGGS.

Caoutchouc, or india rubber, is not a product of this district. The only tree that seems to bear any relation to the india rubber is what is known here as the Moreton Bay fig tree. It, however, is not cultivated for its rubber-bearing qualities, nor has there been, as far as I can learn, any experiment in that direction with it or any other rubber bearing or producing tree, plant, or vine.

New South Wales is not a manufacturing colony, and for that or some other reason does not seem in a hurry to open up or develop any of its wealth of resources, excepting gold, silver, and coal mining, and sheep and cattle raising. It at present is a free-trade country and seems content to let others do its manufacturing for it.

At this port the import returns for the year do not show a single rubber article, though large quantities of rubber goods, chiefly boots and waterproofs, are used here. This is accounted for, however, by the fact that most of the importing houses in this colony are located at Sydney, and the goods used here come through that medium.

On making inquiries at the larger stores here I found no rubber articles of American manufacture, the field being entirely given up to British wares. This being the case, I could make no comparison between American goods and those of other countries.

If I were in possession of the data to be had through the Sydney office I could the better make suggestions that might be of benefit to American rubber manufacturers desirous of extending their trade in this direction.

However, if they can compete in price—and, certainly, from my limited experience I think they can—it only remains for them to get some reliable wholesale firm or firms to take hold of their wares and to make it worth their while to push them. This could best be done by sending some one out to make the necessary arrangements.

GEORGE T. BAGGS,
Commercial Agent.

UNITED STATES COMMERCIAL AGENCY.
Newcastle, December 29, 1890.

PART II.

RUBBER AND RUBBER MANUFACTURES.

CONTINENT OF EUROPE.

AUSTRIA-HUNGARY.

REPORT BY CONSUL-GENERAL GOLDSCHMIDT, OF VIENNA.

Manufactures.—India rubber enters into the manufactures of Austria, and is one of old standing. The goods manufactured have reached a high standard of perfection, including objects for technical, scientific, and for almost all kinds of practical and other purposes. There are in Austria, besides several agencies for foreign manufacturing houses, about thirty-five larger or smaller establishments for the manufacturing of all sorts of articles made out of rubber or caoutchouc in its various states of preparation. The goods produced, wholly or partly of rubber, are: Rubber clothing (waterproofs and waterproof clothing, aprons, etc.), boots and shoes, stockings, leggings, gloves; hose of all kinds, wholly or partly of rubber, also with layers of textile fabric or wire; belting of all kinds, wholly or partly of rubber, also with layers of textile fabric or wire; objects for mechanical and technical purposes, as flanges, stuffings, valves, puffers, etc.; objects for chirurgical and scientific purposes; elastic tissues, toys, combs, canes and whips, etc.

Exports.—The total quantity of rubber and gutta percha and goods thereof exported was in 1890 2,131 metric centners, valued at 932,787 florins; in 1889, 2,275 metric centners, valued at 949,164 florins; the greater part of which was exported to or via Germany; then to or via Roumania, Italy, the ports of Trieste and Fiume; and smaller quantities to or via Russia, Servia, and Switzerland. These goods and their value are specified in the following table:

With the exception of technical articles for machinery, belting, and ebonite articles for dentistry, as mentioned in section 16, American rubber manufactures are but little known here. Aside from the great reluctance which, in this country, is shown to all innovations, both the high customs tariff and the cheapness of labor in Austria-Hungary tend to exclude every article of commerce from abroad, which is not a specialty, and even these are frequently imitated in this country by unscrupulous persons.

I can only say that in view of the above facts the obstacles in the way of an increased import of rubber manufactures from the United States to this country seem almost insurmountable, unless manufacturers confine themselves to the export of specialties which should be secured against imitation by trade-marks registered in this empire. It should especially be observed that such goods are properly packed to suit this market and according to the oftentimes peculiar customs laws. The Austrian merchants are rather conservative, and do not visit the United States. Hence they are little acquainted with the goods manufactured by us and with the wonderful progress the industries of the United States have made within the last two decades. Therefore I would suggest, as I have done before, the establishment of sample rooms in which to exhibit the line of such goods as can be profitably imported into this country. Such a sample room might be connected indirectly with the United States consulate in every large city of Europe. A number of manufacturers of the different branches of industry should combine and bear the expense connected with such an undertaking. By so doing the merchants here would have a constant opportunity to see the product of our industry, which might lead to a steady increase of our imports into this country, which is at present very moderate. The European countries have established such sample rooms all over the world, under the auspices of export societies, and in many instances achieve good results. They even go so far as to establish sample rooms on steamers which touch a number of ports, and thereby open new trade with oriental countries.

JULIUS GOLDSCHMITT,
Consul-General.

UNITED STATES CONSULATE-GENERAL,
Vienna, March 24, 1891.

REICHENBERG.

REPORT BY COMMERCIAL AGENT DAWES.

Rubber enters into none of the manufactures in this district and consequently is not exported in any form.

There is no direct importation of rubber goods either from the United States or other countries, nor would it be possible to build up such a direct trade, as dealers here buy their small stocks from the large cities.

American goods are unknown here. I have never seen a pair of rubber boots in Austria, though clumsy rubber shoes are to be had, which contain no spring and are extremely heavy. These and Mackintoshes, which are much worn, are imported from England and Germany.

I think a trade might be made through dealers in the large cities of Prague and Vienna, so that eventually the goods would also reach this market.

JOHN B. HAWES,
Commercial Agent.

UNITED STATES CONSULATE,
Reichenberg, November 6, 1890.

TRIESTE.

REPORT BY CONSUL HARTIGAN.

Imports.—See accompanying statement of imports and exports in transit.

Manufactures.—No India rubber manufactories in this consular district.

No importation of raw or manufactured rubber goods from the United States.

Although American rubber goods are not imported, they are regarded with favor here.

At present it is difficult to say, on account of the prevailing low prices and competition among the manufacturers in the interior. When the city ceases to be a free port, however, the new arrangement may open the field for introduction of American manufactures.

JAMES F. HARTIGAN,
Consul.

UNITED STATES CONSULATE,
Trieste, December 16, 1890.

Statement showing the imports and exports of caoutchouc at and from Trieste, Austria, during the year ending December 31, 1889.

Countries whence imported.	Description.	Quantity.
Imports in transit:		*Pounds.*
Egypt, 9,600; India, 5,900; France, 1,500; Great Britain, 440.	Raw caoutchouc	17,440
Great Britain, 1,100; Italy, 660; Austrian ports, 220	Manufactured caoutchouc	1,980
Exports in transit:		
Greece, 6,600; Austrian ports, 5,300; Italy, 6,600; Turkey, 3,080; Malta, 1,100; Philippine Islands, 880.	do	23,560

BELGIUM.*

REPORT BY CONSUL STEUART, OF ANTWERP.

"Caoutchouc," or "India rubber," is not manufactured in this consular district.

In reply to this question regarding the "extent of the importation of manufactures of rubber in this district," I offer the following figures, taken from the report of the board of trade of this city recently issued for the year 1889, showing the importation into Antwerp of manufactures of India rubber, namely, from England, to the value of 96,339 francs; from Germany, 5,708 francs; United States, 3,272 francs; Holland, 1,395 francs; and from France, 566 francs, making a total import of 107,280 francs. How many of these goods remain in this consular district there is no method of ascertaining.

The "amount and value of rubber goods imported from the United States," is answered above as fully as possible. The dealers in said goods inform me that the imports from the United States consist principally of boots and shoes.

The field is so limited in this district and American rubber goods are so poorly represented, being confined, as I have remarked, principally to boots and shoes, which do not give entire satisfaction on account of being too light and not fashioned to suit the tastes of the people, that there is no fair opportunity afforded for a comparison between the American goods and those of other countries.

In regard to the suggestions to be offered for the benefit of American manufacturers to extend their trade in this district, I would say that there are a number of considerable factories in Belgium, which find a home market for their products, and England has almost a monopoly of the foreign trade, as shown by the figures given above. In conversation with dealers I am told that they know but little of the American goods, as samples are rarely or never presented upon this market, and that the English goods are much liked and have a high reputation; still, if American samples were placed upon the market in quality and style to suit the tastes of the people, and the prices made to compete with those being offered from other parties, a share of the trade might be obtained.

In the report of the minister of finance for 1888, the latest official figures given upon the foreign trade of Belgium, the following statistics appear upon the imports of caoutchouc for transit and consumption.

The total imports of crude caoutchouc during 1888 amounted to 609,057 kilos, of which quantity 354,563 kilos were entered for consumption, and the remainder, 254,494 kilos were in transit. Of the above imports 289,091 kilos came from England, 135,357 from France, 70,468 from British India, 46,834 from Portugal, and the rest from Germany, Holland, and Brazil.

**Rubber duties:* Crude rubber, free; rubber manufactures, 10 per cent.

The total value of general imports of manufactures of India rubber for the same time amounted to 1,830,955 francs, of which 643,628 francs were declared for consumption, and 1,187,327 francs were declared for transit. England furnished 630,050 francs, France 554,644 francs, Germany 526,343 francs, and the rest came from Switzerland and Holland.

JOHN H. STEUART,
Consul.

UNITED STATES CONSULATE,
Antwerp, November 14, 1890.

BELGIUM.

REPORT BY CONSUL ROOSEVELT, OF BRUSSELS.

CRUDE RUBBER IMPORTS.

Rubber is imported into Belgium from Austria, Brazil, Congo Free State, East Indies, England, France, Germany, Holland, Portugal, and other countries. The botanical name of the principal vine-producing caouthouc in the Congo is Landolphia florida.

There is no import or export duty on crude rubber in Belgium. During the years 1888, 1889, and first six months of 1890 the Congo Free State exported direct to Belgium the following amount of caoutchouc: 1888, 60 kilograms, 210 francs ($40.55); 1889, 14,177 kilograms, 49,269.50 francs ($9,509.01); the first six months of 1890, 17,262 kilograms, 60,417 francs ($11,660.48). Since October 1, 1890, the Congo Free State has imposed an export duty of 50 francs ($9.65) per 100 kilograms of caoutchouc exported.

The following table shows the amount of crude rubber imported into Belgium during the years 1887 and 1888, and countries from whence imported:

Countries.	1887.			1888.		
	Kilograms.	Francs.	Dollars.	Kilograms.	Francs.	Dollars.
Austria				3,586	12,551	2,422.34
Brazil				12,894	44,972	8,679.60
Congo	2,550	8,925	1,722.53	60	210	40.53
England	96,863	339,021	65,431.05	140,506	491,771	94,911.80
East Indies				70,468	246,638	47,601.13
France	59,984	209,944	40,519.19	59,423	207,980	40,140.14
Germany	7,217	25,260	4,875.18	11,341	39,693	7,660.75
Holland	5,804	20,314	3,920.60	5,985	20,947	4,042.77
Portugal	72,119	252,416	48,716.29	46,834	163,919	31,636.37
Other countries	194	679	131.05	3,571	12,499	2,412.31
Total	244,731	856,559	165,315.89	354,623	1,241,180	239,547.74

Export of crude rubber for Belgium.

Countries.	1887.			1888.		
	Kilograms.	Francs.	Dollars.	Kilograms.	Francs.	Dollars.
China	1,700	5,950	1,148.35			
Denmark	66,167	231,585	44,695.91	94,356	330,246	63,737.48
England	4,740	16,590	3,201.87	32,756	114,646	22,126.68
France	20,756	72,646	14,020.68	15,861	55,514	10,714.20
Germany	13,213	46,245	8,925.28	5,950	20,825	4,019.22
Hamburg				4,227	14,794	2,855.24
Holland	987	3,454	666.62	2,674	9,359	1,806.29
Luxemburg	1,205	4,217	813.88			
Russia				52,394	183,379	35,392.15
Switzerland	84	294	56.74	10,005	350,018	6,758.47
United States				36,680	128,380	24,777.34
Other countries	277	970	187.21	2,461	8,613	1,662.31
Total	109,129	381,951	73,716.54	257,364	900,774	173,849.38

BELGIAN MANUFACTURES.

There are two rubber factories in the city of Brussels, C. Jenatzy Leleux and Eug, Pavoux & Co., who manufacture belting, hose of all varieties, rollers, molds, springs, tubing, stamps, joints, pipes, mats, packing, etc. Rubber cloth is not manufactured in this consular district, but is imported from England, France, and Germany.

EXPORTS OF RUBBER GOODS.

During the years 1887 and 1888 rubber goods were exported from Belgium as follows:

Countries.	1887.		1888.	
	Francs.	Dollars.	Francs.	Dollars.
Brazil	1,620	312.66		
Chile			100	19.30
China	300	57.90		
England	19,370	3,738.41	11,959	2,308.09
France	53,876	10,398.06	78,113	15,075.81
Germany	10,062	1,941.97	34,403	6,639.78
Hamburgh	2,050	395.65		
Holland	13,127	2,533.51	11,117	2,146.58
Italy	2,170	418.81	3,585	691.90
Luxemburgh	12,928	2,495.10	3,875	747.88
Spain	1,943	375.00		
Switzerland	1,410	272.13	150	28.95
Other countries	1,505	290.47	7,544	1,455.99
Total	120,361	23,229.67	150,846	29,113.28

IMPORTS OF RUBBER MANUFACTURES.

The following table shows the amount of manufactured rubber imported into Brussels during the year 1889, and countries from whence imported:

Countries.	Value of imports.		Duties received.	
	Francs.	Dollars.	Francs.	Dollars.
England	100,820	19,458.26	10,082.00	1,945.82
France	69,147	13,345.37	6,914.70	1,334.54
Germany	53,914	10,405.40	5,391.40	1,040.54
Holland	3,914	755.40	391.40	75.54
Total	227,795	43,964.43	22,779.50	4,396.44

Rubber clothing, shoes, etc., are imported from England, France, and Germany. England, however, principally supplies the trade. Russia also exports to Belgium rubber shoes and other articles of wearing apparel, but no entry of said goods appears upon the records of the custom-house at Brussels, as they are imported from Germany, and are consequently entered as German goods.

Such few American rubber goods as are sold in Belgium come from England, and are entered as English goods. The principal American goods sold in this city are rubber shoes, surgical and dental articles.

Statement showing the manufactured rubber goods imported into Belgium.

Countries.	1887.		1888.	
	Francs.	Dollars.	Francs.	Dollars.
England	360,445	69,565.88	408,825	78,903.23
France	102,007	19,687.35	104,740	20,214.82
Germany	80,880	15,609.84	115,708	22,349.01
Hamburg	531	102.48	3,604	695.57
Holland	6,262	1,208.57	8,156	1,574.10
United States	.....	.....	2,179	420.55
Other countries	.....	.....	326	62.92
Total	550,125	106,174.12	643,628	124,220.20

The duty on foreign manufactures of rubber coming into Belgium is 10 per cent ad valorem.

AMERICAN GOODS.

As mentioned above the greater part of American rubber goods found on this market is imported from England. I am informed by reliable dealers that American rubber goods are highly esteemed here, on account of their superior quality, and could such goods be placed direct upon this market at equally advantageous figures as similar goods coming from other countries a large and profitable trade might be established.

RUBBER STATISTICS.

Statement showing the importation, exportation, and domestic consumption of crude caoutchouc in Belgium at various times since 1850.

Description.	1850.	1860.	1875.	1880.	1885.	1886.	1887.	1888.
	Kilos.	*Kilos.*	*Kilos.*	*Kilos.*	*Kilos.*	*Kilos.*	*Kilos.*	*Kilos.*
Importations	4,540	57,974	152,277	196,739	159,166	180,824	244,731	354,623
Exportations	1,559	9,432	47,849	17,629	37,659	124,715	109,129	257,364
Consumption	2,981	42,542	104,428	121,507	121,507	56,109	135,602	97,259

Statement showing the amount of articles manufactured from caoutchouc imported, exported, and consumed in Belgium at various periods since 1850.

Description.	1850.		1860.		1875.		1889.	
	Francs.	Dollars.	Francs.	Dollars.	Francs.	Dollars.	Francs.	Dollars.
Importation	106,929	20,637.28	317,706	61,317.26	891,000	171,963	936,000	180,648
Exportation	924	178.33	30,738	5,932.43	197,000	38,021	226,000	43,618
Consumption	106,005	20,458.97	286,968	54,384.82	694,000	133,942	710,000	137,030

Description.	1885.		1886.		1887.		1888.	
	Francs.	Dollars.	Francs.	Dollars.	Francs.	Dollars.	Francs.	Dollars.
Importation	496,000	95,628	561,273	108,325.69	559,125	106,174.12	643,628	124,220.20
Exportation	135,000	26,055	123,739	23,881.63	120,361	23,229.67	150,846	29,113.28
Consumption	361,100	69,673	437,534	84,443.06	429,764	82,844.45	492,782	95,106.92

Rubber goods dealers, in Brussels.

C. Jenatzy-Leleux, 115 avenue de la Reine.
Eug. Pavoux & Co., 14 and 16 rue De Launoy.
J. Bertrand, 25 rue des Canions.
Coenen & Co., 28 rue du Chmiste.
Ed. Bellens, 42 rue de la Riviere.
Edouard Bender & Co., 34 rue de la France.
Vre Botz & Co., 53 rue Belliard.
Adelin Briard, 64 rue Vande Weyer.
Franz Clouth, 23 rue des Riches Claires.
P. J. De Bosschére, 15 rue Honblon.
A. de Geradon, 4 rue de la Violette.
L. de la Charlerie, 87 rue De Mérode.
L. Delperdange, 126 rue Brabant.
Ed. Demets, 100 rue d'Allemagne.
Droeshout Soeurs, 2 rue du Chapeau.
H. Dubois, 100 rue de Terre-Neuve.
E. Elst, 45 rue Montagne des Herbes-Potageres.
G. Grubben, 109 rue de Progrés.
R. Himburg, 6 rue Zérégo.
H. Jamaulle, 27 rue des Riches-Claires.
A. Juhr & Co., 19 rue des Donge-Apôtes.
F. Klinkhammer, 65 rue Foulons.
E. Loeffler, 27 rue des Tanneurs.
Vre. G. Luyckx, 28 rue Neuve.
Ch. Maes, 2 Place Rouppe.
L. Mairlot, 18 Place Ste. Gudule.
J. Max, 51 rue des Bouchers.
P. Metz, 174 rue Masui.
Parmentier & Lemmer, 49 Boulevard du Midi.
Joseph J. Perry, 85 Boulevard Anspach.
Philippet & Co., 27 rue des Riches Claires.
J. Ramu, 151 rue de Terre-Neuve.
Eugéne Reichert, 23 rue des Riches Claires.
M. Schleisinger fils, 10 rue Vieux Marcheaux Grains.
F. Schmetz, 33 rue des Comediens.
A. Stroobants, 8 rue Rouppe.
E. Van de Kerkhore, 24 rue de l'Evéque.
Vre. J. B. Verloay, 50 rue d'Arenburg.
H. Weyland, 14 Place Ste. Gudele.

I attach herewith price list of C. Janatzy-Leleux and Eug. Pavoux & Co.

GEO. W. ROOSEVELT,
Consul.

UNITED STATES CONSULATE,
Brussels, November 5, 1890.

GHENT.

REPORT BY CONSUL OSBORNE.

There are two establishments in the city of Ghent for the manufacture of articles in India rubber. The most important is that of Mr. Pol. De Schamphelaere, to whom I am indebted for most of the information following. The other establishment makes a specialty of belting for machinery, some of which is exported to neighboring countries; but the proprietor has been afraid to give any information. My remarks are therefore confined to the larger one.

The principal articles manufactured are belting, hose, valves, rollers for machinery, joints, pads for doors and windows, cushions for billiard tables, rugs, erasers, etc.

Exports are made to France, Germany, Italy, and England.

Most of the rubber articles exposed for sale in the stores are imported from England, Germany, and France. Articles of wearing apparel, such as waterproof coats, cloaks, shoes, etc., come chiefly from England and Germany. A great variety of toys are imported from France and to some extent from Germany. The leading store in the city for the sale of all these classes of articles is also owned by Mr. De Schamphelaere. He reports that nothing is imported from the United States, and is unable to express an opinion on the quality of American productions.

In conclusion, I may say it seems possible for our manufacturers to secure a field in this part of Belgium. Generally speaking, if they can compete with the countries which I have mentioned as the sources of the imported articles, they should find a profitable field here. To this end they might communicate with those handling this class of goods. Circulars and inquiries, to be most effective, should be in the French language.

JOHN B. OSBORNE,
United States Consul.

UNITED STATES CONSULATE,
Ghent, November 26, 1890.

LIEGE.

REPORT BY CONSUL DANFORTH.

The manufacture of India rubber is comparatively small and insignificant. The articles manufactured consist of clothing, hose, and belting, and does not fully supply home demand. Most of the other articles are wholly imported.

Exportation is of no importance.

Printed price lists do not exist and prices could not be obtained, as manufacturers and dealers do not find it worth the trouble to make them as they are not able to export.

The importation amounts to about $200,000 per annum.

About 90 per cent of rubber goods are imported, but only a very small percentage, consisting especially of boots and shoes, came from the United States.

American rubber goods are considered of superior quality, but they are not as tastily made up, and on this account are not in such demand as goods from other countries, especially England.

The difference in the appearance of mackintoshes and waterproofs, as well as shoes, is very striking.

In order to create business in this country American manufacturers must, while keeping up the superior quality, pay more regard to the exterior finish, making goods more attractive.

JAMES R. DANFORTH,
Consul.

UNITED STATES CONSULATE,
Liege, November 10, 1890.

DENMARK.

REPORT BY CONSUL RYDER, OF COPENHAGEN.

No india-rubber goods worth mentioning are produced in this consular district, and consequently none exported.

The extent of the importation of manufactures of rubber goods can not be given, as these wares are partly entered and classified under machinery, leather goods, and ready-made clothing, etc. The greater part is imported from Germany and England.

The amount and value imported from the United States can not be given, for the reason above stated, but it is said to be about the same as the imports from England. American rubber goods are regarded here as first class, fully equal to English and far superior to German.

The duties imposed upon foreign manufactures of rubber are on blocks, sheets, belting, etc., 10.25 crowns per hundredweight, and on other manufactures 33.33 crowns per hundredweight; equal to $2.78 and $9.06, respectively.

A Danish crown is equal to 26.80 cents, and one centnerweight English to 101½ Danish pounds.

HENRY B. RYDER,
Consul.

UNITED STATES CONSULATE,
Copenhagen, December 30, 1890.

FRANCE.*

REPORT BY COMMERCIAL AGENT LOOMIS, OF ST. ETIENNE.

Among European countries England, thanks to its well-organized looms for the production of light material, holds the supremacy in the market as far as india-rubber tissue coats and cloaks are concerned. France excels in the manufacture of small objects, such as tobacco pouches, balloons, toys, and those tissues destined for garters and suspenders. It is also devoting great energy to the manufacture of straps, tubes, and waterproof shoes, and is struggling to reconquer the market for vulcanized india rubber.

VALUE OF THE OUTPUT.

The value of the French manufacture to-day is about 70,000,000 of francs, representing the home consumption, while the exportation amounts to nearly the same. The industry is now in a prosperous state, but is threatened by growing competition from Belgium, Germany, and Italy.

The considerable expenditure on coal for the vulcanizing process and the difference in price of the fabrication places the French industry in a less advantageous position than that of Italy or Germany.

THE RAW MATERIAL.

The caoutchouc is imported in divers forms and in different degrees of purity according to the degree of civilization of the country from which it is procured.

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*FRENCH RUBBER DUTIES.

Under the present tariff.

Rubber and gutta-percha imported from non-European country (crude)		Free.
Rubber and gutta-percha imported by way of Europe, per 100 kilos.	francs.	3.60
Rubber and gutta-percha, manufactures of, per 100 kilos:		
Pure or mixed	do...	20.00
On cloth or other material	do...	100.00
As elastic cloth	do...	200.00
Shoes	do...	60.00
Ready-made rubber clothing	do...	120.00

Under the proposed tariff.

Crude same as under existing law.

	General tariff.	Minimum tariff.
	Francs.	*Francs.*
Manufactures of:		
Pure or mixed, per 100 kilos	50	40
On cloth or other material, do	150	100
As elastic cloth, do	200	150
Shoes, do	80	60
Ready-made clothing, do	200	150

It is received in the shape of thin sheets, called *feuilles anglaises*, and cut into square threads rolled around metallic mandrils. The elastic tissues are obtained by combining vulcanized India-rubber threads with wool and silk forming the warp, and cotton or silk threads forming the woof.

They are put on the market in the shape of braids, laces, and bands, not exceeding generally 6 inches in width, and are employed for hats, shoes, suspenders, gaiters, and bandages.

The manufacture of elastic tissues is chiefly pursued in St. Chamond, a suburb of St. Etienne, Rouen, Nîmes, Mayenne, and Paris.

RAW MATERIAL USED.

In 1836 France employed 72,000 pounds of caoutchouc; in 1862, 1,800,000, and in 1870, 2,500,000 pounds were used. To-day this amount has increased to 4,000,000, representing 12,000,000 francs. The yearly exportation to all parts of the world of manufactured goods exceeds 600,000 pounds.

In spite of this apparent prosperity a part of this industry, especially that which concerns the boots and shoes, has suffered greatly in the last few years from the decline in the price and from a decrease in the exportations.

In the departments of the Loire and Rhone twenty-three manufactories, with 579 looms, existed in 1881; at present there are only twelve, with 219 looms.

THE TARIFF.

The tariff commission, which is drafting a new customs law for France, has recommended the increase of duties on all manufactured goods containing rubber. The object of the proposed increase is to exclude importations of manufactured articles from England, Belgium, Germany, and Italy.

Table showing the actual duties and the proposed increase.

Articles.	Present tariff.	Proposed tariff.	Articles.	Present tariff	Proposed tariff.
	Francs.	*Francs.*		*Francs.*	*Francs.*
Caoutchouc, pure, and non-vulcanized and vulcanized India-rubber thread, per 200 lbs.	20	50	India-rubber wearing apparel	120	200
Elastic tissue....per 200 lbs.	200	250	Slippers	60	80
Piece elastic tissue.....do..	100	150	All other goods	40	90

The indications are that the proposed increase of duties will be voted by the Parliament.

FRANCIS B. LOOMIS,
Commercial Agent.

UNITED STATES COMMERCIAL AGENCY,
St. Etienne, April 30, 1891.

BRITTANY.

REPORT BY VICE-CONSUL BENNETT, OF NANTES.

India rubber, or caoutchouc, is not a product of this consular district, and so far as I have been able to learn no attempt has ever been made to cultivate the rubber tree on this western coast of France. There are no manufactures of rubber goods in this consular district, and very few or no imports of the crude article. Consequently the India-rubber industry of Nantes is confined exclusively to the retail trade, and with the exception of coats, cloaks, and such like garments, which certain merchant tailors make to order, is confined to a few dealers, who make a specialty of manufactured caoutchouc in all of its various forms.

At first thought one would be inclined to consider the rubber industry of Nantes as of minor importance, but upon reflection, when considering the multitude of articles that are manufactured wholly or in part from caoutchouc, or gutta-percha—the articles of necessity, the numberless articles of pleasure, and all the other various articles that are offered to the public; the useful with the ornamental; the various objects made for the medical and chirurgical service; toys to amuse children, together with coats, cloaks, boots, and shoes, and the quantity of rubber consumed in the rapidly increasing velocipede craze—one is struck by the importance of this industry.

Owing to the climate, to the very wet weather which prevails here during the winter season—during the autumn and winter months at Nantes and throughout Brittany generally it rains a great portion of the time, a fact which accounts for a very extensive sale of coats, cloaks, etc.—every man, woman, and child of means possesses a rubber covering of some sort. The material in general use for men's and boys' coats is a rubber cloth resembling Scotch plaids or English cloth. These coats, having the appearance of an ordinary light overcoat, are given the preference over all others, notwithstanding the high price as compared with certain manufactures of the United States. Gents' coats, ready made, are sold at from $10 to $15 each, according to the quality; made to order, the price is somewhat increased—$15 to $18. Ladies' cloaks are made of lighter materials, and are quite elegant and not embarrassing.

Rubber shoes without heels are worn to a great extent. Shoes without heels are simply a covering for the toe and instep, running back to the heel of the boot, with an elastic band passing around the heel to keep them in place. This system leaves the heel of the under boot free, and the wearer is very much less likely to slip and slide than with the ordinary full shoe; at least such is the not unreasonable pretension of the manufacturers. These shoes are sold at from 80 cents to $1 per pair.

Besides coats, cloaks, boots, and shoes, and the other innumerable articles made in part or wholly of rubber, there is the velocipede, which,

since the introduction of the bicyclette, has come suddenly into very general use, not with amateurs alone, but also in the army, where it is employed quite extensively. This industry consumes a large quantity of rubber for its wheels and pedals, which is furnished entirely by one English manufacturer.

The smaller articles—balls, doll babies, toys of all sorts—together with the numerous objects of utility, are mostly of French manufacture.

Cloth for coats and cloaks is divided between French and English manufacturers.

Having now passed hurriedly over the different kinds of rubber goods that are offered for sale by the dealers of Nantes, I am sorry to add that there are few, if any, articles in the foregoing list supplied by manufacturers of the United States. The very few articles of our manufacture that might be found here are brought from Paris and are laden with extra freight and commissioners' expenses.

Here is an industry; here is a market worth securing; and I have no doubt that by operating intelligently manufacturers of the United States could gain a large part of this trade. It would be necessary to export directly to Nantes by way of St. Nazaire, and avoid as much as possible all unnecessary freight and commission charges. By this means first-class goods could, I think, be offered to the public at lower prices than are actually paid for the same. Goods shipped by way of Havre, and from there passing through the hands of commission men of Paris, arrive at Nantes heavily handicapped as to price. This idea would apply not only to rubber goods, but to manufactures of the United States in general. Our manufacturers as a class do not search markets for their goods with sufficient care; they seem always ready and willing to export their goods to Paris and the other capital cities of Europe, but neglect largely the smaller provincial cities. This is, it seems to me, a very grave error. They do not, and with reason, care to ship their goods to a foreign port more or less unknown and there consign them for sale to persons they know nothing of. On the other hand, small tradespeople here can hardly be expected to send directly to the United States, and there apply for their goods to persons entirely unknown to them; hence they go to Paris, where they can see what they purchase; but there they are obliged to pay the third party's commission or profits. Is there not some way to overcome this difficulty, which in reality is nothing more than a difficulty of nonacquaintance? Could not manufacturers, through the agency of the consular service, secure reliable young men to represent them abroad? I think they could. It would need a little confidence on the part of manufacturers and some discretion on the part of consular officers. Or, in order to make the expenses lighter to each individual manufacturer, let six or eight or more manufacturers combine and send energetic persons over to Europe to open depots in the larger provincial cities of Europe, where the different manufactures of the United States could be

seen and appreciated; where samples of goods could be placed before the dealers, and comparison made with those of French, English, or German manufacture. I am certain that with a little energy and intelligence, a depot always open where goods could be seen, a good trade, a good and durable industry could be secured that is now possessed by the English and German manufacturers. Direct importation is what is most to be desired, and this could be accomplished without much difficulty if the question of acquaintance and confidence were once settled. A large wholesale warehouse at Nantes could supply the whole western coast of France with but little expense.

A comparison of the imports of rubber to France from the United States and from England for the year 1889 shows very unfavorably for the United States:

	United States.	England.
	Francs.	*Francs.*
Crude rubber	397,122	4,478,382
Manufactured	.....	1,043,462
Total	397,122	8,521,844

From this statement it appears that England furnishes twenty times more rubber, crude and manufactured, to France than the United States. It belongs to our manufacturers to remedy this.

H. D. BENNETT,
Vice-Consul.

UNITED STATES CONSULATE,
Nantes, November 4, 1890.

Cognac.—The little rubber used here in a retail way is manufactured in Paris or elsewhere, and I can not learn of any American rubber goods being imported here.

To introduce American rubber manufactured goods, it would have to be done through agents in Paris or Bordeaux.

WM. S. PRESTON,
United States Consul.

COGNAC, *December 11, 1890.*

HAVRE.

REPORT BY VICE-CONSUL HAYNE.

There are no manufactures of india rubber in the Havre consular district.

As there are no manufactures of india rubber in this district, all the exportations which go through the port of Havre, whether crude or manufactured, are either from depot here, or from the interior.

The values of the importations not being attainable at the Havre customs, were procured from the Havre Chamber of Commerce, and are as follows:

	1886.	1887.	1888.	1889.	1890.*
Crude India rubber	$822,652	$1,628,395	$1,554,117	$1,451,057	$1,458,21[illegible]
Manufactured India rubber	49,372	49,356	83,182	71,647	62,12[illegible]

*Nine Months.

The crude importations passing through the port of Havre (all destined to other places) come from all india rubber-producing countries, direct or via the United States, whilst the manufactured (also destined to other places) comes chiefly from the United States; also india rubber manufactured goods used at Havre come from French or American houses at Paris.

The values of the exportations not being attainable at the Havre customs, were procured from the Chamber of Commerce, and are as follows:

	1886.	1887.	1888.	1889.	1890.*	Total.
Crude india rubber	$349,388.20	$408,222.60	$405,641.80	$388,846.60	$469,505.80	$2,021,605.00
Manufactured india rubber	324,411.60	336,152.40	405,850.80	361,417.80	334,085.60	1,761,918.20

* Nine months.

Exports from Havre, France, to the United States of crude India rubber, as per consular invoices issued from this consulate, from and including the year 1886 to the third consular quarter of 1890.

Year.	Amount.	Value.
	Pounds.	
1886	196,658	$140,133.32
1887	107,723	61,599.14
1888	168,598	78,446.87
1889	344,144	100,434.87
1890 (nine months)	205,241	129,472.21
Total	1,022,364	510,077.41

I would suggest, for the benefit of American rubber manufacturers desirous of extending their trade in this district, the employment of experienced and able American commercial agents or travelers, thoroughly understanding the French language, and being well acquainted with French commercial business habits. The German and English owe to such means the successful laying of their goods on the French markets.

JAMES B. HAYNE,
Vice-Consul.

UNITED STATES CONSULATE,
Havre, November 18, 1890.

IMPORTATIONS.

Statement of amount of India rubber, crude or melted and manufactured, imported through the port of Havre during the years 1886, 1887, 1888, 1889, and the first nine months of 1890.

GENERAL COMMERCE.

Years.	1886.	1887.	1888.	1889.	† 1890.
	Pounds.	*Pounds.*	*Pounds.*	*Pounds.*	*Pounds.*
Crude India rubber or melted	1,713,859	3,131,528	2,988,687	3,023,035	3,033,292
Manufactured India rubber	54,309	54,291	91,500	78,841	68,332

† Nine months.

* As translated for the Havre customs returns.

EXPORTATIONS.

India rubber and gutta-percha, crude or melted, in blocks (exported through the port of Havre) during the years 1886, 1887, 1888, 1889, and the nine first months of 1890.

		Pounds.
1886.—Germany		96,514
	Holland	33,398
	Belgium	20,902
	England	244,891
	Spain	1,465
	United States of America	324,832
	New Granada	1,100
	Brazil	2,695
	Argentine Republic	396
	Spanish America	1,276
	Martinique	422
	Total	727,891
1887.—Norway		72
	Denmark	13,200
	Germany	143,721
	Holland	26,475
	Belgium	12,531
	England	391,283
	Portugal	86
	Spain	24
	Italy	3,760
	Switzerland	13,730
	United States of America	179,397
	Brazil	623
	Guadeloupe	178
	Total	785,080
1888.—Germany		199,465
	Holland	27,379
	Belgium	8,800
	England	255,277
	Portugal	3,212
	Japan	517
	United States of America	278,425
	Mexico	818
	Brazil	449
	Chile	1,502
1888.—Spanish America		1,760
	Martinique	55
	French Guiana	2,220
	Total	779,879
1889.—Denmark		12,320
	Germany	228,861
	Holland	37,140
	England	177,568
	Portugal	1,595
	Greece	317
	United States of America	344,694
	New Granada	286
	Brazil	974
	Argentine Republic	629
	Chile	374
	English North America	5,060
	Guadeloupe	266
	Martinique	11
	Total	810,095
1890.*—Russia		24,479
	Sweden	435
	Denmark	33,955
	Germany	121,743
	Holland	12,423
	Belgium	8,580
	England	240,222
	Portugal	1,078
	Spain	132
	United States of America	502,955
	New Granada	391
	Brazil	1,287
	Argentine Republic	55
	English America	10,340
	French Indo-China	1,076
	Martinique	594
	Total	959,676

*From January 1st to September 30th.

Manufactured India rubber and gutta-percha exported through the port of Havre, France, during the year 1886, 1887, 1888, 1889, and the nine first months of 1890.

MANUFACTURED INDIA RUBBER AND GUTTA-PERCHA, PURE AND MIXED.

	Pounds.
1886.—Sweden	6,424
Norway	3,579
Denmark	3,051
Germany	8,320
Belgium	594
England	7,214
Portugal	8,831
Spain	1,808
Japan	4,879
United States of America	38,891
Mexico	3,386
New Granada	22,380
Brazil	15,525
Uruguay	600
Argentine Republic	18,196
Chile	3,262
Peru	1,045
St. Thomas	576
Algiers	779
Guadeloupe	2,092
Martinque	2,334
Reunion	1,170
Total	149,936

APPLICATIONS ON TISSUES.

Germany	1,606
England	5,302
New Grenada	8,419
Brazil	418
Argentine Republic	5,016
Chile	1,909
Peru	415
Total	23,085

ELASTIC TISSUES.

Sweden	1,137
Denmark	3,757
Germany	58,273
England	7,486
Portugal	1,373
Spain	653
United States of America	63,793
Mexico	6,787
Guatemala	488
New Grenada	7,104
Brazil	8,932
Uruguay	1,857
Argentine Republic	7,187
Chile	5,069
Peru	4,314
Ecuador	147
Haiti	352
St. Thomas	576
English America	880
Algiers	2,442
Martinque	50
Total	182,057

BOOTS AND SHOES.

Sweden	94
England	2,272
China	253
Guatemala	59
Brazil	88
Argentine Republic	488
Chile	2,171
St. Thomas	154
Total	5,579

MANUFACTURED INDIA RUBBER AND GUTTA-PERCHA, PURE AND MIXED.

	Pounds.
1887.—Sweden	1,551
Norway	1,315
Denmark	7,80[illegible]
Germany	5[illegible]
Holland	[illegible]
Belgium	[illegible]
England	24,8[illegible]
Portugal	20,9[illegible]
Spain	3,[illegible]
Turkey	[illegible]
Egypt	[illegible]
English Africa (East)	[illegible]
Holland India	1,[illegible]
Philippine Islands	[illegible]
China	1,[illegible]
Japan	13,[illegible]
United States of America	43,[illegible]
Mexico	1,315
New Grenada	23,263
Brazil	9,900
Uruguay	704
Argentine Republic	20,902
Chile	297
Peru	330
Haiti	411
St. Thomas	321
English America (North)	649
Spanish America	724
New Caledonia	534
Algiers	396
Guadeloupe	1,139
Martinique	220
Réunion	2,380
Total	184,662

APPLICATIONS ON TISSUES.

Denmark	662
Eastern Africa	57
United States of America	1,773
Mexico	105
Argentine Republic	220
Chile	129
Gaboon	44
Total	3,001

ELASTIC TISSUES.

Sweden	[illegible]
Norway	53
Denmark	7,324
Germany	[illegible],3757
Holland	2,486
England	5,381
Portugal	1,854
Spain	1,57[illegible]
Turkey	81[illegible]
United States of America	49,82[illegible]
Mexico	12,1[illegible]
Guatemala	1,3[illegible]
New Grenada	3,5[illegible]
Venezuela	3
Brazil	3,[illegible]
Uruguay	[illegible]
Argentine Republic	6,[illegible]
Chile	4,[illegible]
Peru	2,3
Haiti	1
St. Thomas	1,3[illegible]
English America (North)	5[illegible]
Spanish America	15
Cochin China	26[illegible]
Algiers	1,08[illegible]
Total	[illegible]07,395

Manufactured India rubber and gutta-percha exported through the port of Havre, France, during years 1886, 1887, 1888, 1889, and nine first months of 1890—Continued.

BOOTS AND SHOES.

	Pounds.
87.—England	864
Brazil	825
Chile	132
Total	1,821

MANUFACTURED INDIA RUBBER AND GUTTA-PERCHA, PURE AND MIXED.

88.—Russia	785
Sweden	2,417
Norway	1,135
Denmark	471
Germany	16,933
Belgium	9,948
England	5,634
Portugal	24,741
Spain	3,797
Turkey	50
Egypt	2,473
East Africa	638
China	1,430
Japan	6,518
Australia	458
United States	27,471
Mexico	4,998
New Grenada	20,048
Brazil	13,336
Uruguay	686
Argentine Republic	16,168
Chile	3,548
Peru	220
Haiti	2,919
St. Thomas	402
English America (North)	209
Spanish America	1,434
Indo-China (French)	603
Algiers	1,067
Guadeloupe	2,448
Martinique	396
Réunion	1,535
Total	174,916

APPLICATIONS ON TISSUES.

Denmark	134
Germany	1,949
England	132
Portugal	1,377
Spain	84
United States of America	7,088
Mexico	4
New Granada	132
Brazil	1,236
Argentine Republic	372
Chile	220
Peru	440
English America (North)	319
Algiers	306
Total	13,793

ELASTIC TISSUES.

Japan	1,267
Russia	127
Sweden	4,433
Norway	297
Denmark	13,455
Germany	123,741
England	3,317
Portugal	6,816
Spain	42
Turkey	248
Africa	213
Australia	440
Philippines	264
United States of America	46,140
Mexico	16,881

ELASTIC TISSUES—continued.

	Pounds.
1888.—Guatemala	675
New Granada	2,277
Venezuela	387
Brazil	8,380
Uruguay	440
Argentine Republic	7,865
Chile	1,071
Peru	3,533
Ecuador	770
Haiti	303
St. Thomas	10,428
English America (North)	284
Spanish America	4,046
Indo-China (French)	185
Gaboon	114
Total	258,439

BOOTS AND SHOES.

Denmark	462
England	264
Portugal	952
Turkey	1,784
Egypt	5,566
Australia	1,560
United States of America	48
Brazil	1,320
Argentine Republic	550
Chile	308
French Guiana	1,032
Total	13,846

MANUFACTURED INDIA RUBBER AND GUTTA-PERCHA, PURE AND MIXED.

1889.—Sweden	1,632
Norway	550
Denmark	301
Germany	6,010
England	5,494
Portugal	24,169
Spain	6,536
Roumania	1,093
Turkey	2,358
Egypt	1,192
Eastern Africa	334
Other part of Africa	66
China	803
Japan	12,249
Philippines	5,586
Australia	1,126
United States of America	48,367
Mexico	5,555
New Granada	1,942
Brazil	12,397
Uruguay	4,576
Argentine Republic	12,784
Chile	1,855
Peru	4,239
Hayti	880
St. Thomas	354
English America (North)	37
Spanish America	1,140
Dutch America	1,062
Algiers	4,690
Reunion	1,146
Indo-China (French)	191
Martinique	143
Guadeloupe	1,082
Total	171,939

APPLICATIONS ON TISSUES.

Denmark	136
Germany	1,089
Portugal	1,060
Turkey	369
United States of America	2,739

Manufactured India rubber and gutta-percha exported through the port of Havre, France, during years 1886, 1887, 1888, 1889, and nine first months of 1890—Continued.

APPLICATIONS ON TISSUES—continued.

	Pounds.
1889.—New Granada	807
Venezuela	158
Argentine Republic	1,019
Chile	473
Guadeloupe	268
Martinique	409
Reunion	57
Total	8,584

ELASTIC TISSUE.

Sweden	4,519
Norway	570
Denmark	11,946
Germany	53,079
Holland	66
Belgium	1,973
England	18,766
Portugal	3,914
Spain	46
Philippines	5,430
English India	257
China	495
Japan	2,845
United States of America	57,108
Mexico	16,247
Guatemala	546
New Granada	2,240
Venezuela	823
Brazil	11,869
Uruguay	1,967
Argentine Republic	14,144
Chile	4,085
Peru	5,634
Ecuador	132
Hayti	68
St. Thomas	1,615
Spanish America	79
English America (North)	11,788
French Guiana	1,489
Total	233,740

BOOTS AND SHOES.

England	1,003
Philippines	748
Mexico	308
Venezuela	158
Brazil	612
Argentine Republic	114
Chile	6,534
Total	9,477

MANUFACTURED INDIA RUBBER AND GUTTA-PERCHA, PURE AND MIXED.

1890.*—Sweden	1,256
Norway	2,433
Denmark	1,866
Germany	2,558
Holland	2,233
Belgium	180
England	3,221
Portugal	13,200
Spain	5,355
Turkey	1,318
Egypt	1,001
English Africa (East)	1,223
Other parts of Africa	8,281
Dutch India	396
Philippines	198
China	418
Japan	2,360
United States of America	29,447
Mexico	1,602
New Granada	1,454
Venezuela	55
Brazil	15,948
Uruguay	1,421

MANUFACTURED INDIA RUBBER AND GUTTA-PERCHA, PURE AND MIXED—continued.

	Pounds.
1890.—Argentine Republic	18,253
Chile	4,873
Peru	2,860
Haiti	2,343
St. Thomas	76
Spanish America	64
Algiers	4,0[illegible]
French Guiana	
Mayotte	
Reunion	1,6[illegible]
French Indo-China	3,0[illegible]
Martinique	1,[illegible]
Guadeloupe	[illegible]
Total	138,[illegible]

APPLICATIONS ON TISSUES.

Sweden	[illegible]
England	990
Portugal	746
Spain	565
United States of America	3,340
Mexico	581
New Granada	194
Brazil	628
Argentine Republic	1,483
Algiers	298
Peru	308
Total	9,998

ELASTIC TISSUES.

Russia	191
Sweden	5,504
Norway	559
Denmark	7,687
Germany	41,215
England	2,312
Portugal	1,082
Spain	44
Turkey	559
English Africa (East)	1,683
Philippines	1,146
British India	451
China	114
Japan	1,324
United States of America	57,380
Mexico	11,911
Guatemala	238
New Granada	2,946
Venezuela	594
Brazil	6,604
Uruguay	1,485
Argentine Republic	5,597
Chile	2,266
Peru	3,810
Hayti	332
St. Thomas	2,724
Spanish America	2,464
Algiers	702
French Indo-China	484
Martinique	81
Total	163,489

BOOTS AND SHOES.

Portugal	968
England	304
Spain	84
Japan	506
Mexico	3,729
Brazil	284
Argentine Republic	4,519
Martinique	165
Guadeloupe	145
Total	10,736

*From January 1 to September 30.

LIMOGES.

REPORT BY COMMERCIAL AGENT GRIFFIN.

There is no manufactory of rubber goods, and no rubber articles are sent directly from the United States to this consular district to my knowledge. Thinking that perhaps there might be a trade in American goods, two years ago an American manufacturer at my request sent samples of rubber cloth. These were exhibited to dealers, who pronounced them superior in impermability to those sent from other countries. The prices are lower, I think, than the same style of English and French goods; the great complaint against these is that they are not waterproof. I would suggest to manufacturers in America desirous of placing their merchandise on the French market that the best way would be to introduce a full line of goods, so that the cheaper qualities could be seen as well as the finer. Let an American have the sole charge of the business; using foreign houses to introduce American goods is always dangerous. Were a full line of American rubber goods properly shown in France, I firmly believe that they would find a ready market.

WALTER T. GRIFFIN,
Commercial Agent.

UNITED STATES COMMERCIAL AGENCY,
Limoges, France, December 22, 1890.

MARSEILLES.

REPORT BY CONSUL TRAIL.

CRUDE RUBBER.

Rubber in its crude state was imported from Senegal, Madagascar, Mozambique, Mauritius, Venezuela, Brazil, India, and Australia to the amount of about 400,000 kilos in 1889. More than half this quantity came from the three African sources of supply.

Importation of crude India rubber (caoutchouc) at Marseilles for the year 1889.

From—	Kilos.	Value (per kilo).
		Francs.
Senegal	100,000	3.00 to 5.50
Madagascar	80,000	4.00 to 6.00
Mozambique	30,000	4.75 to 5.40
Total	210,000	.....

Nearly one-sixth of this rubber importation at Marseilles in 1889 was exported to the United States.

In 1889, of the 400,000 kilos imported, 285,575 kilos were exported in the same crude state, viz: 35,427 kilos to the United States, amounting in value to 230,275 francs, 163,965 kilos to England, 58,460 kilos to Algeria, and the remainder to Germany, Belgium, and Italy.

The only rubber exported from Marseilles to the United States is the crude article. The statistics of the chamber of commerce for 1889 give as the amount exported that year to the United States 35,427 kilos, valued at 230,275 francs. The value of rubber exported to the United States, as given in the invoices passed through the Marseilles consulate for 1889, was 99,907.60 francs, or less than one-half of the total exportation for that year, according to the statistics of the chamber of commerce. The larger part, then, of this rubber was transshipped at Marseilles, but not purchased here.

MANUFACTURES.

The importation of rubber manufactures amounted to 54,786 kilos in 1889. Of manufactured articles of rubber, pure or mixed, 1,969 kilos came from the United States, 8,797 kilos from Italy, 7,776 kilos from England, and 2,755 kilos from Switzerland, Germany, and Belgium. Of manufactured articles, rubber on cloth or on other material, there was imported the same year, none from the United States, 4,930 kilos from England, 3,275 kilos from Italy, 997 kilos from China, and 295 kilos from other countries.

Of rubber, or elastic cloth, the importation, same year, was 336 kilos from the United States, 20,623 kilos from Switzerland, 1,603 kilos from England, 471 kilos from Germany, and 1,059 kilos from other countries.

The following price list of a representative manufacturer gives the cost of rubber as regards its use in certain industries in Marseilles:

Price list of Vve. M. Crausaz, of Marseilles.

NOTE.—The tubing is usually made in lengths of 10 meters but for special orders it can be made of any desired length and without joints.

Price per meter.

Interior diameters in millimeters.	For steam pressure, wrapped with canvas.				Interior diameters in millimeters.	For suction, wrapped with wire.			Interior diameters in millimeters.	For suction, spirale noyee ou nue intérieure.		
	1 wrapper.	2 wrappers.	3 wrappers.	4 wrappers.		2 wrappers.	3 wrappers.	4 wrappers.		2 wrappers.	3 wrappers.	4 wrappers.
10	1.10	1.85	2.35	3.00	10	2.40	3.15	3.65	10	3.40	3.95	4.70
12	1.30	2.05	2.75	3.50	12	2.75	3.45	4.00	12	3.75	4.25	5.00
15	1.70	2.45	3.25	4.10	15	3.50	4.45	5.20	15	4.75	5.50	6.20
18	1.85	2.65	3.45	4.35	18	3.80	4.85	5.90	18	5.10	6.20	7.05
20	2.35	3.15	4.20	5.30	20	4.30	5.45	6.70	20	5.50	6.75	8.00
25	2.60	3.40	4.85	5.80	25	4.95	6.50	7.75	25	6.45	7.95	9.00
30	3.00	3.85	5.75	6.75	30	6.00	7.50	9.00	30	7.50	9.00	10.50
35	3.45	4.35	6.65	7.85	35	7.00	8.45	10.50	35	8.90	10.50	12.00
40	3.90	5.10	7.40	9.10	40	8.00	9.80	11.50	40	10.00	12.00	13.50
45	4.45	5.90	8.20	10.20	45	9.00	10.50	12.80	45	11.00	13.50	15.00
50	5.00	6.85	9.00	11.35	50	10.00	12.40	14.40	50	12.40	15.00	16.80
55	5.45	7.30	9.80	12.35	55	11.00	13.50	15.80	55	13.20	16.45	18.50
60	6.00	7.90	10.80	13.40	60	12.00	14.50	17.00	60	15.00	18.00	20.00
70	6.90	9.00	12.75	14.90	70	13.90	16.80	20.25	70	17.45	21.00	23.40
80	7.75	10.50	14.40	16.45	80	16.00	19.30	22.50	80	20.50	25.00	27.90
90	8.60	11.50	15.90	18.40	90	17.50	21.00	24.70	90	24.50	28.50	32.40
100	9.50	12.70	17.50	20.25	100	19.50	23.54	27.50	100	28.50	32.00	37.30
110	10.40	13.90	18.90	22.10	110	22.00	26.00	30.00	110	32.00	35.00	40.50
120	11.40	15.20	20.40	24.15	120	24.00	28.50	33.00	120	35.00	39.00	44.00
130	12.10	16.40	22.00	25.80	130	26.50	32.00	36.00	130	38.00	43.00	47.50
140	13.00	17.65	23.40	27.80	140	28.90	35.00	39.00	140	41.00	47.00	51.50
150	13.80	18.90	24.80	29.90	150	31.00	37.00	43.00	150	44.00	50.00	55.50
160	14.60	20.00	25.90	31.00	160	33.30	39.10	46.10	160	47.10	53.20	59.00
170	15.45	21.10	27.00	32.10	170	35.40	41.20	49.20	170	50.20	56.40	63.10
180	16.10	22.20	28.10	33.20	180	37.50	43.40	52.30	180	53.30	59.60	67.30
190	17.20	23.30	29.30	34.30	190	39.60	45.60	55.40	190	56.40	62.70	71.30
200	18.30	24.40	30.30	35.40	200	41.80	47.90	58.50	200	59.50	65.80	75.40
Tubing for beer pumps and for high pressure, all diameters, 7 francs per kilo.					Special tubing for curves.				Wrapped with wire, 2 francs per kilo.			

RUBBER TUBING.

For gas, water, air, and liquids without pressure:
Superior gray of all sizes, 10 francs per kilo.
Black, ordinary, 8 francs per kilo.

Rubber tubing wrapped with hemp canvas for steam pressure, pumps, hose, distilleries, breweries, etc., and tubing strengthened with spiral wire embedded in the rubber or simply wrapped round the tube for suction, applied to steam, liquids, sewerage, and the drawing off (of wine) from one cask and discharging into another.

One meter of tubing for pressure, with one hemp wrapper with diameter inside of 10 mm., costs 1 franc 10 centimes; with double wrapping, 1 franc 85 centimes; with triple wrapping, 2 francs 35 centimes; with quadruple wrapping, 3 francs; and so on, in proportion to the increasing diameter of the inside of the tube, up to a diameter of 200 mm., or 7.874 inches; when, if the tube has four wrappers, the price per 1 yard 3½ inches, 35 francs 40 centimes, or about $7.08. For suction tubes the price per meter or 1 yard 3½ inches runs from 48 cents up to $15.08, as will appear by reference to the price list of Vee M. Crausaz of Marseilles in above table.

Rubber clothing, boots, and shoes are in slight demand in the south of France. Those I found in retail stores bore the mark of a Paris house, but I am informed that these articles are made in England.

I have not been able to discover what the nature of the rubber goods imported from the United States was. The value was only slightly over $3,000. This information must be obtainable in New York.

Rubber manufacturers desirous of extending their trade into this district should make the effort through the services of some one fully acquainted with the trade and with the language and commercial customs of this country.

The agents at Cette and Toulon report that there was no importation of rubber to those ports from the States, and it is highly improbable that any went to Bastia. There were no rubber exports from those ports to the United States.

CHARLES B. TRAIL,
Consul.

UNITED STATES CONSULATE,
Marseilles, November 26, 1890.

NICE.

REPORT BY CONSUL BRADLEY.

No rubber goods of any description are manufactured in my district, and while the *Ficus elastica* grows in the open air around Nice it does not flourish and is not utilized in any way except for ornament. Rubber goods come to Nice from the following firms in other parts of France:

Hose and tubing—Lerenard, Alfortville.
Surgical appliances—Gauthey & Haussmann, 43 rue Greneta, Paris.
Clothing—Maurel, 140 rue de Rivoli, Paris.
Sheet rubber—Bergueraud, 16 rue des Archives, Paris.
Industrial articles—Carrillon, Clermont-Ferraud.
Shoes—Hutchinson, 1 rue d'Hauteville, Paris.
Mme. Veuve Crozat, Marseilles, furnishes a few things.

The only way to introduce the goods here is by means of active agents. Traveling men from Germany and England come here every year. A man with headquarters at Marseilles could cover all the south of France and north of Spain and Italy. I think the goods could be laid down at Marseilles, and any coast points, by water from New York, at rates comparing favorably with overland rates from England or Germany and as quickly. Expositions of the different lines of goods combined in the larger cities would be of assistance. Small things were apt to be overlooked at the Paris Exposition last year, there was so much to see, but I saw a few articles from there for sale in Marseilles.

WM. HARRISON BRADLEY,
Consul.

UNITED STATES CONSULATE,
Nice, November 20, 1890.

RHEIMS.

REPORT BY CONSUL ANGIER.

So far as I can learn there is in this consular district but one firm (Messrs. E. Lefébure, F. Gougy & Co., of St. Quentin, department of Aisne) engaged in the manufacture of rubber articles. Their manufactures are clothing textures and mechanical goods.

Articles of rubber manufacture, such as rubber clothing, boots and shoes, hose, belting, etc., sold in this district at retail are purchased principally from the rubber manufacturers near Paris. So far as I can learn there are no wholesale or jobbing houses of India-rubber goods in this district.

In view of labor being so much cheaper in this country than in the United States; in view, also, that the manufacturers in France can purchase the crude rubber (on which there is no import duty) as cheaply as the American manufacturers can, I deem it useless to offer any suggestions for the benefit of American rubber manufacturers desirous of extending their trade to this country, for, in view of all the foregoing, I do not believe that the American manufacturers can compete successfully with the French manufacturers of India-rubber goods.

There is nothing further to report from this district touching the manufacture of rubber goods. However, in this connection it may not be out of place for me to mention the works of Messrs. Lufbery & Chardonnier, at Chauny, department of Aisne, in this consular district. This firm has two factories for manufacturing a substitute for rubber, and chemicals expressly for this industry and considerable quantities of their products are sent to the United States, and I am called on frequently to legalize or authenticate the invoices of their shipments to our country.

ALTON ANGIER,
Consul.

UNITED STATES CONSULATE,
Rheims, November 4, 1890.

Roubaix.—There is neither important manufacture nor trade in rubber goods in this district. The retail merchants who keep rubber apparel in small quantities, usually in conjunction with other goods, obtain their supplies as a rule from Paris; occasionally they buy from England. Rubber in a crude state is imported from England by a few manufacturers, who convert it into rubber sheets and belts, such as are used in and about the machinery employed in the large looms and mills in this district.

There is also an important manufacture of mats and hose.—(W. R. Atwell, Commercial Agent, Roubaix, December 8, 1890.)

ROUEN.

REPORT BY CONSUL WILLIAMS.

There are no manufactories of India rubber in this consular district, nor any tradesmen who deal exclusively in the article. The sales are such as would be naturally required in a city of this size and its surroundings, divided among a half dozen dealers, who purchase chiefly from French and Belgian manufacturers and are convinced that they can thus obtain their supplies more cheaply than elsewhere. They purchase boots and shoes of India rubber in Boston, as the American manufacture of these articles is superior to any other.

They are costly, pay heavy duty, and are articles of luxury and of very limited sale. I inclose the names of the dealers should interested parties desire to communicate with them:

Boulard (Veuve), No. 28 Jeanne d'Arc street.
Bomdon (G.). No. 19 Quai de la Bourse.
Fauvel, No. 107 Lafayette street.
Vallée, H., No. 4 de la Ferme street.
Welby de Ruffigny, No. 7 Jeanne d'Arc street.

CHARLES P. WILLIAMS,
Consul.

ROUEN, FRANCE, *October 22, 1890.*

SOUTHWEST FRANCE.

REPORT BY CONSUL KNOWLTON, OF BORDEAUX.

The employment of rubber in the vulcanized state is comparatively limited. So little is it used in the districts adjacent to or within the city of Bordeaux, at least, that it has been deemed injudicious to establish factories for its production or to enter into competition with the manufacturers of Great Britain, from which country is derived the principal supply.

Yet in the city of Paris the manufacture of vulcanized rubber appears to be a by no means unimportant industry. From the only available statistics of production at hand I find that as far back as 1867 the consumption in France of crude India rubber amounted to 180,000 pounds, the value of which in a manufactured state was $15,000,000, an indication that the industry in question was more fully developed in France at that period than in Great Britain.

Although the winter season in the southwestern portion of France is extremely damp and rainy, rubber clothing, mackintoshes, etc., are rarely seen; boots and overshoes of the same material never, except, perhaps, in shop windows. Even in the manufacture from caoutchouc of vulcanized rubber and its collateral products, such as hose pipe, belting, gas and other tubing, the French are seemingly behind the times. Garden hose, for example, is usually made of iron pipe, jointed at dis-

tances of about 6 feet in length and awkwardly supported upon little 2-inch wheels. The same is true of all agricultural implements, mechanical appliances, clothing, etc. Not that it is impossible to obtain in the larger cities any article required of the material in question; it is but necessary to state that in this respect, as in all others, the French are slow to avail themselves of modern advantages and improvements.

Rubber and rubber goods are imported into France chiefly from Great Britain. All articles sold in this particular line are guaranteed to be of English origin. In Bordeaux, at least, only English goods are in demany, while the rubber manufactured in Paris finds its way to this market as an imitation of the British product.

Exportation of the same material from the port of Bordeaux, on the other hand, is either limited or does not exist. It is possible that a very little passes through this center in transportation to the colonies, but but even this is doubtful.

The product is derived chiefly from Africa, the Indies, Brazil, and Para.

The quantity of rubber in its manufactured state imported into France from America is approximately estimated for the year 1889 to amount in value to $36,000. Duty, 20 to 40 per cent ad valorem.

Preference, as before stated, is given to English goods; afterward to the Parisian. The American article is adjudged a third place on the list. Exactly how just this estimate of quality may be is not for me to decide.

I can scarcely find suggestions to offer for the benefit of American rubber manufacturers desirous of extending their trade in this direction. The retail supply, though comparatively small, is at least in excess of the demand. Vigorous competition and cheaper, though not inferior, goods might, at all events, warrant experiment.

HORACE G. KNOWLES,
Consul.

UNITED STATES CONSULATE,
Bordeaux, December 9, 1890.

GERMANY.*

AIX-LA-CHAPELLE.

REPORT BY CONSUL ZEIGLER.

There are no manufactures of goods in this district into which rubber enters as a component part.

There is no duty on crude rubber, but on the various goods into which it enters and forms a part there is a duty of from 3 marks to 130 marks per 100 kilos.

I can find no rubber goods imported from the United States, but was shown ordinary shoes which I was assured were of American make, but upon examination found them stamped "North British Rubber Company, Edinburgh," retail price, say $1.10, while others were stamped "American India Rubber Company, Saint Petersburg," price, say $1.35, both kinds being somewhat heavy and clumsy; finding none of the light, fine makes so common in the United States.

Many kinds of rubber goods sold here are made in England, and there is a large manufactory in the adjoining district, at Cologne, whose goods are sold largely throughout Germany and perhaps exported to other countries.

Dealers here generally order such goods from German wholesale houses through traveling agents, and I have been unable to obtain any price lists.

As to the best methods of extending American trade in the direction named, in my opinion the only feasible way would be by samples, relying upon the superior quality, perfection, and desirability of the goods offered, as traders are slow in making changes in lines and makes of any wares which they are accustomed to sell.

As to the extent of importation into this district it is impossible to obtain any reliable data, such information and that of a similar nature being difficult to obtain.

S. B. ZEIGLER,
Consul.

UNITED STATES CONSULATE,
Aix-la-Chapelle, November 8, 1890.

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* *Duties.*—Manufactures of India rubber imported into Germany are subject to the following specific duties per 105 kilos (220 pounds):

	Marks.	
Crude rubber and gutta-percha, free.		
Gutta-percha in threads or strips, not combined with other materials	3	=$0.71
Rubber shoes and clothing	40	= 9.52
Toys in hard or soft rubber (gray)	40	= 9.52
All articles in vulcanized rubber or xylonite	40	= 9.52
Toys in soft rubber, varnished, colored, or decorated	60	=14.28
Gutta-percha combined with webs of woolen, cotton, or linen	90	=21.42
Elastic webbing and rubber passementerie	90	=21.42
Hose, belting, packing, and wagon covers	24	= 5.71

ANNABERG.

REPORT BY CONSUL HUBBARD.

India-rubber goods are not manufactured in this consular district, and, so far as I can learn, there are no American rubber goods offered for sale here. On a recent occasion a shopkeeper in the city of Annaberg showed me a pair of rubber overshoes which he said were manufactured in America, and the price of them he stated was $1.75. On examining them I found the Russian eagle stamped on the bottom with other hieroglyphics which plainly indicated they were of Russian origin. They were heavy and clumsy, but not quite up to the German standard in this respect.

In my opinion American rubber goods would not be popular in this consular district, especially American overshoes, for the reason that they are too light in weight. The Saxon people are accustomed to estimate the value of an article by its size and weight.

This idea seems to prevail in regard to agricultural implements and vehicles of all kinds, as well as boots and shoes. Even the locks and keys are of monstrous proportions and nearly as large as the celebrated key of the Bastile, exhibited to visitors at Mount Vernon, Va.

Specific duties are imposed by the German Government upon all manufactures of rubber. The duty varies according to the quality of the goods. The lowest rate is 2.7 cents per pound and the highest 10 cents per pound.

There seems to be nothing prohibitive in these rates, and they alone would not offer any special obstacle to American manufacturers desirous of extending their tradeinto this district. In order to create a demand for their goods, however, it would be necessary to make them heavier and clumsier than any rubber goods I have ever seen offered for sale in the American market.

DANIEL B. HUBBARD,
Consul.

UNITED STATES CONSULATE,
Annaberg, November 13, 1890.

BRESLAU.

REPORT BY CONSUL HAYDEN.

India rubber enters into the manufacture of goods used in this district, to wit: Rubber clothing, boots, overshoes, belting, and the like. These are all imported, however, principally from France and England. I have discovered no American importation, and in point of durability, manufacture, and appearance the goods offered for sale here are vastly inferior and at least 40 per cent dearer. In my opinion this district offers to American manufacturers of rubber goods a good market, for

the following reasons: The general superiority of the American article, and the fact that these goods are sold much cheaper in the United States.

JOSEPH EDWARD HAYDEN,
UNITED STATES CONSULATE, *Consul.*
Breslau, March 17, 1891.

COLOGNE.

REPORT BY CONSUL WAMER.

With the exception of toys, combs, shoes, plain and colored balls and fancy goods, all classes of india-rubber goods, chiefly hose, belting, sheeting, matting, and cords, are manufactured in Cologne. I am told that the annual production amounts to about $300,000 in value.

I am informed that the exportation is not very large, and principally to England and Austria.

Waterproof garments and a limited amount of belting are imported from England. The former goods, however, are not worn to any extent by the Germans here. Rubber shoes are imported pretty extensively here from Russia. In a conversation with a large dealer in this city he informed me that the superiority of the Russian shoes consisted in their elegant fit, and not that they lasted any longer than those made in other countries. Formerly American shoes were imported to a limited extent, but their styles did not suit the taste of the Germans.

I have been unable to find in this district American rubber goods that would be worth while to make mention of.

(18) How are American rubber goods regarded in comparison with those from other countries?

In putting this question to the largest manufacturer of rubber goods in this city, his answer was: American manufactures are known to supply quite as good and quite as bad goods as the manufacturers of other countries, it depending on the demand of the buyers.

I should think that if large manufacturers in the United States would send over intelligent representatives with samples of their special make of goods there might be a chance of introducing and extending their trade in this district. I am informed, however, that the prices are very much depressed in consequence of there being a large production.

WM. D. WAMER,
UNITED STATES CONSULATE, *Consul.*
Cologne, May 23, 1891.

GREFELD.

REPORT BY CONSUL BLAKE.

We have but one warehouse where rubber goods are exclusively sold. This is only a branch store, the main warehouse being in Cologne (about

30 miles distant). A large assortment of rubber goods are for sale, consisting of clothing, boots and shoes, hose, belting and bags, dolls, and various other specialties of rubber manufacture. Rubber clothing in the piece (silk and wool) is imported from England and manufactured into various outside garments; such clothing is in general use, on account of frequent rain in this section. Rubber boots and shoes are in great demand, for the reasons above stated. There is a large demand for rubber hose in sizes from ¾ to 1½ inches. Belting is not used in this district. Rubber bags, dolls, and other articles are sold in large quantities; earrings, medallions, pins, bracelets, watch chains, brooches, combs, hairpins; fancy things made of corals and metals; standing collars, turned collars, cuffs, different styles for adults and children; cravats in bright and dark colors; collar and cuff buttons with pearl, ivory, and rubber; soap and brushes to clean washing; tourists' satchels, with different kinds of leather in yellow, black, and brown colors, lined with rubber; combs and brushes, bathing tubs, wash basins of rubber, light, and can be folded, pillows in fancy color; waterproof hunting-jackets from 13 marks upwards; knapsack made of brown köper, with rubber lining, waterproof; waterproofs for men and boys from 10 marks up; ladies' waterproofs in silk and wool; pants, hats; rubber shoes, high and low; rubber boots; shoes with rubber soles, used in cycling, gymnasium, and lawn tennis—these goods are exported to Austria, Switzerland, and France, but to what extent I can not state, as the manufactories are not in this district.

Nearly all of the manufactures of rubber are imported from England, except a small percentage coming from America and Holland.

Only rubber shoes are imported from the United States. The amount will not exceed $5,000 per annum.

The only goods of American manufacture are ladies' and gentlemen's shoes. They are made in better style, and are considered far superior to other goods of the same class manufactured either in England, Germany, or France.

The demand for rubber clothing, boots and shoes, hose, and other articles is universal, not only in this part of Germany, but throughout the whole German Empire. Undoubtedly the style of goods manufactured in America would meet with favor, as such goods can be sold in this market at lower prices than at present obtained. In establishing a depot for the sale of American goods it would be advisable to place some one in charge who thoroughly understands the German language, ways, and customs. I have no doubt large and successful sales could be made by establishing the main warehouse at or near seaport cities, and I am assured that good and satisfactory sales could be made.

EVANS BLAKE,
Consul.

UNITED STATES CONSULATE,
Crefeld, March 12, 1891.

DRESDEN.

REPORT BY CONSUL PALMER.

There is only one small manufactory in this district, where surgical and various small patent articles are made. They are sold almost entirely in Germany and Austria. A price list is herewith inclosed.

The crude rubber obtained is imported in patent plates from Hanover and Manchester and is free of duty. The duty on foreign manufactured rubber is 40 marks per 100 kilos.

German manufactures of rubber have very much improved in the last ten years, so that they practically control the market with the exception of boots and shoes, which are imported from St. Petersburg and from the British Rubber Company, of Edinburgh. The Russian are preferred on account of their felt lining and thickness of rubber.

There are considerable quantities of Russian and English boots and shoes sold here, but there is no means of getting the exact amount consumed.

American goods are so little known and used here that they may practically be considered not in the market.

If properly advertised and exhibited by competent agents a market for boots and shoes probably might be made.

AULICK PALMER,
Consul.

UNITED STATES CONSULATE,
Dresden, January 24, 1891.

DUSSELDORF.

REPORT BY CONSUL PARTELLO.

RUBBER TREES ARE PLANTS.

The trees and plants under this general name are natives of Mexico, Central America, Brazil, Guiana, Peru, and the East Indies. The Mexican tree belongs to a special class, and the South American trees are known under a variety of names which have been given them by naturalists. The trees which furnish the greater part of the caoutchouc brought from the East Indies are the *Ficus elastica* of Assam, which is considered one of the noblest of trees, and beyond the Ganges are found inexhaustible forests thereof. They have been found at a height of 100 feet and at a circumference of 60 to 75 feet.

The *Castilloa elastica*, the Mexican tree, grows from 50 to 100 feet high, and from 8 to 20 feet in diameter.

The South American tree varies from 25 to upward of 100 feet in height. The most important, however, is that found in the province of Para, south of the equator, in Brazil and which furnishes to commerce immense quantities of caoutchouc, from this source the supply of raw material in Europe being chiefly drawn.

CRUDE RUBBER.

It is understood that the best rubber used in Germany comes from Para, the product of trees alone; a small quantity, considered of an inferior quality, is received from the East Indies and Africa, and is obtained partly from trees and partly from shrubs.

MANUFACTURES.

India rubber enters into the manufactures of this district to a small degree only, the industry being more important and carried on to a larger extent in other parts of Germany.

The largest and best known establishment of the kind in Germany is located at Harburg on the Elbe near Hamburg, though at Cologne and some of the more important commercial cities rubber goods are manufactured to a considerable extent.

There is at Mannheim a very important boot and shoe manufactory.

All classes of goods are manufactured, including clothing, boots, shoes, hose, belting, knit and web goods, thread, and technical articles.

The particular classes of goods manufactured within this district are to a limited extent hose and belting, webs, technical articles, and thread.

Exports.—About one-half of the rubber goods manufactured in Germany are sold in the country for home consumption; the remainder is exported to foreign markets. The export to Russia was extensive in former years, but since that country increased the rate of duty the exports have fallen off.

The rubber manufactures of Germany find their way into nearly every country in the world.

Shipments to a considerable extent are made into Italy, Spain, and South America, with an important trade in webs and technical articles with England.

Imports.—With the exception of thread I do not believe that manufactured goods are imported into Germany to any great extent. A limited quantity of rubber goods are imported into Germany from England, France, and America.

I have made careful inquiry upon the point of rubber importations from the United States and reliable information is difficult to obtain. With the raw material free of duty in Germany, and labor at a much lower rate than in the United States, one would naturally think that rubber goods would be offered at exceedingly low prices in this market, but the contrary is the case. The general run of prices throughout the list are much in advance of those in the United States. We must therefore conclude that clothing, boots, shoes, hose, belting, technical, web, and knit goods are sold at a large profit to the manufacturers and dealers.

Take for example the items gentlemen's rubber shoes and ladies' half shoes. These are sold at prices from 20 to 30 per cent above American rates, and so in like proportion with other articles through the list. In comparison with American goods, in many instances inferior in style and quality, though if not in advance of, at least equal to, American prices.

AMERICAN RUBBER GOODS.

In my judgment the American rubber goods will in general terms compare favorably in quality with those of any country in the world.

A detailed comparison and description can not be made without reference to and the examination of samples, but while many articles of German manufacture are strong and well made they are lacking in style and finish as compared with American goods.

Considerable feeling exists on the part of German manufacturers and tradesmen against the American policy of protection, and the Germans are not disposed to give aid or comfort either as to information relative to their business or in the introduction of American merchandise.

The introduction of American rubber goods in Germany is therefore simply a matter of business.

If the American goods, which are decidedly better in style and finer in finish, can be placed upon this market for sale at even a slight reduction below German prices, the consumer, ever ready to save a pfennig, will buy them. No encouragement can be expected from those in the trade, and it resolves itself into a question of cost of home production, to which must be added freight, incidental expenses, and German customs duty, the same to be compared with the trade prices in Germany.

If such comparison be favorable to American prices, I am of the opinion that if some of our enterprising merchants, instead of locating an agency with samples, would place upon sale in some one or more of the important cities, say Frankfort, Berlin, Dresden, or Cologne, a large, well-selected stock of American rubber goods, their efforts would in due time be rewarded with success.

Upon further inquiry and the examination of goods offered for sale, I find a considerable quantity, particularly ladies' and gentlemen's shoes, bearing French trade-marks, which would indicate that French goods, on account of superiority in style and finish, were finding their way into this market.

In a conversation had with the leading manufacturer in this district, the remark was made by him: "I do not believe that there is a market here for American rubber goods, as the German manufacturers are sending their goods to almost all civilized countries." But, as stated above, I am of the opinion that if our manufacturers can see their way clear to place the goods in this market at the slightest reduction in price the enterprise will prove successful.

The superiority of the French rubber goods in style and finish over the German having given them a reputation in this market, many of the dealers have resorted to the plan of sending their goods of German manufacture into France, and after having French trade-marks affixed to them they have been returned and sold in Germany as French goods.

D. J. PARTELLO,
Consul.

UNITED STATES CONSULATE,
Dusseldorf, February 18, 1891.

FRANKFORT ON THE MAIN.

REPORT OF CONSUL-GENERAL MASON.

CRUDE RUBBER.

The supply of crude material which is consumed by the rubber goods manufactured in this district is derived in about equal proportions from Africa and from Central and South America. For reasons well known in the commercial world, the price of crude gutta-percha has nearly doubled during the past year, and manufacturers, here as elsewhere, are anxious about the cost and adequacy of future supplies of that important material. It is felt that unless the natural trees in rubber-producing countries can be preserved and made more productive by more judicious and less destructive methods, or replaced by artificial cultivation, the constantly increasing use of rubber goods will make the raw caoutchouc so costly as to revolutionize the commercial aspect of rubber manufacture. It is hoped that the extension of the German colonies in Africa will result in augmenting the supply of caoutchouc from that quarter. Although of inferior quality, as compared with the gutta-percha from Pará, it is still valuable for many purposes and is used largely in the manufactures of this country.

THE MANUFACTURE AND SALE OF INDIA-RUBBER GOODS.

There are in Frankfort several important dealers in rubber goods, whose assortments comprise everything from hose, belting, and packing to the most delicate toilet articles and surgical fixtures in hard and soft material. One of these houses, the oldest and most extensive, was established when rubber manufactures first became known in general commerce. It has kept pace with all improvements and inventions in rubber manufacture, and, although it has never manufactured on its own account, is now the leading firm of its class in Southern Germany. A glance through its extensive stock will give, therefore, a correct insight into the rubber-goods trade in this vicinity. In answer to the question "what American goods they have in stock," the reply was "only shoes." The more carefully such an assortment is examined the more one is impressed with the extent to which various branches of rubber manufacture, which originated in the United States, have been domesticated in Germany. The import duty upon such merchandise, established by the German tariff laws, gives an opportunity which manufacturers have been prompt to utilize until everything from seamless rubber hose to elastic bands and vulcanized combs are now manufactured in this country, not only for local sale, but for export. In Hanover there is an extensive manufacture of rubber toys. The New York and Hamburg Gummi-Waaren Fabrik at Hamburg is a vigorous and successful enterprise, which combines American methods with German capital and labor under the protection of the German tariff. In the same city the New York Belting and Packing Company has an immense establishment for the manufacture of those articles.

Elsewhere in this country combs, buttons, and all the vast assortment of toilet, surgical, and household articles manufactured of hard or vulcanized rubber under the Goodyear patents are made in quantities sufficient to supply the German market and leave a surplus for export.

But what is perhaps most surprising is the fact that the greater part of the rubber sandals and overshoes sold in this part of Germany are manufactured in St. Petersburg by the Russian-American Rubber Company, which imports its raw material from South America through an import tariff and send its products into Germany through another import tariff ($10 per 100 kilos) and yet undersells the Scotch, English, and American goods, while it surpasses in quality and elegance the best products of the German manufacturers. In spite of all opposition and two adverse tariffs, the Russian-American Company is steadily gaining control of the trade in Germany. It has an immense depot at Hamburg and has built up an enormous and rapidly increasing trade. It is believed by dealers here who sell the goods of this company that it must receive from the Russian Government some special encouragement, either as bounty on its exported goods or a remission of the duties on the raw material used in their manufacture, perhaps both. However this may be, the essential fact is that their goods now practically dominate the market in Western Germany to the exclusion of German as well as American and English products of the same class.

Another Frankfort dealer has a small factory in the suburban town of Sachsenhausen, where certain kinds of hose and packing are made, but there are in this district only two manufactories of rubber goods sufficiently important to deserve mention in this report. These are the Süddeutschen Gummi-Waaren Fabrik, at Offenbach, a manufacturing town located several miles east of Frankfort, and the Frankfurter Gummi-Waaren Fabrik, at Gelnhausen, about 15 miles beyond Hanau.

The first of these was established in 1881, and manufactures principally four classes of articles, viz, rubber hose, packing, belting, and pencil-erasers, besides a small quantity of certain specialties in which hard and soft rubber are used in combination. This firm uses Brazilian and African caoutchouc in the proportion one-fourth to three-fourths, respectively. The raw material from Pará is purchased mainly in Liverpool, that from Africa comes via Hamburg and Bremen, which have become, through the extension of German colonies in the dark continent, important markets for the crude gutta-percha traffic. The two price lists of the factory at Offenbach, which are submitted as inclosures with this report, will show the scope of their manufacture and the conditions on which their products are offered to the trade.

But by far the most important and comprehensive statement of its class in this district is the Frankfurter Gummi-Waaren Fabrik, which was founded in this city many years ago, and in 1870 was reorganized, capitalized on larger scale, and removed to Gelnhausen, a small town about 30 miles east of Frankfort, where extensive buildings were erected

and the industry established under most favorable conditions. This company manufactures annually goods which are valued at $200,000 and include the following articles: railway supplies, such as car buffers and cushions, tubing and packing for air brakes, mats for passenger carriages, etc.; ships' materials, steam and water packing, soles for tennis, tourists' and sporting shoes of many kinds, pencil-erasers, elastic bands, and various articles of rubber stationery, tubes, filters, stoppers and other laboratory apparatus, belting and hose in large variety, the latter being made on a cotton web woven by an American process patented and owned by a Boston Woven Hose Company; water-proof mantles, coats, and miners' clothing, besides full line of faucets, valves, and connections in vulcanized rubber. Ordinary sandals and overshoes are not made by this company, its shoes being of leather, canvas, felt, or other materials, with soles of India rubber. Many of these soles are of exceedingly neat and attractive workmanship and have entirely supplanted in local trade the goods of that class which were formerly imported from England. There is in the whole field of German industry nothing which illustrates more forcibly the efficiency of a protective tariff in stimulating and sustaining a new and important branch of production than the rubber manufacture. It is the unanimous testimony of the manufacturers and dealers with whom I have conversed that without protection the rubber industry could not have been successfully established in this country. How successful it has become under the present system will be apparent from the proportion of rubber goods now exported from Germany.

From the most trustworthy statistics that can be obtained it appears that only 40 per cent of the rubber goods manufactured in this district are consumed in Germany. Of the remainder, 5 per cent are exported to Switzerland; 20 per cent to Austria and the Levant; 10 per cent to Australia; 20 per cent to Great Britain and her other colonies, and 5 per cent to Holland.

There are no statistics showing the amount or value of rubber goods imported to this district from the United States. The only records on the subject are those for the whole of Germany, which are available only down to December, 1888. These show that during 1888 Germany imported from the United States 32,000 kilograms of raw caoutchouc, and 49,000 kilograms of rubber goods, against 18,000 kilograms of rubber manufactures, largely toys from the Sonneberg and Hanover districts, which were exported during the same year from Germany to the United States. While it is therefore impossible to classify closely the imports of rubber manufactures from our country to Germany in any specified year, it would appear from the testimony of dealers that they belong mainly under the category of hose, packing, belting, and overshoes of the arctic type, in the production of which American workers are unexcelled.

As has been already indicated, American India rubber goods are con-

sidered equal to the best in the trade. They are usually cheaper than English goods of corresponding grades and superior in quality to the French. Americans have also pushed rubber manufacture into many ingenious specialties which have not hitherto, or at least not until recently, been manufactured in this country. But, as a principle, it may be understood that the German manufacturers are alert and enterprising. If they are not notably ingenious and original, they are clever and zealous copyists. They are well informed, they employ the most improved machinery and methods, and they contest stubbornly every inch of the ground formerly held by the importers of foreign-made rubber goods. The fact that the factories in the district of Frankfort export six-tenths of their entire product to foreign countries will indicate how successfully this industry has been established here.

The only apparent way in which the sale of American rubber goods can be increased in Germany is probably by sending skillful salesmen, with samples of the most modern and highly improved manufactures, to be sold on easy terms and at the lowest practicable prices. Even then the field is not promising. Germany is not looking much for manufactured goods from any foreign country, and least of all from the United States.

FRANK H. MASON,
Consul-General.

UNITED STATES CONSULATE-GENERAL.
Frankfort-on-the-Main, November 14, 1890.

HAMBURG.

REPORT BY CONSUL JOHNSON.

IMPORTS OF CRUDE RUBBER.

India rubber is imported into this port, principally from Africa, in large quantities. In 1889 the imports of crude India rubber, on which there is no import duty in Germany, amounted to 6,696,693 pounds, and the average price paid for the same was $88.87 per 100 kilograms. In 1888 the import amounted to 7,255,559 pounds, and the average price paid was $91.02 per 100 kilograms. In 1887, 6,039,943 pounds were imported, and the average price was 452.61 marks per 100 kilograms.

EXPORTS OF RUBBER GOODS.

India rubber enters largely into the manufactures of this district, all classes of rubber goods being produced here. These manufactures are mostly intended for consumption in Germany, but are also exported to a considerable extent. The exports of rubber and rubber manufactures from Hamburg for 1889 were as follows:

Exports.

RUBBER SHOES.

To—	Amount.	To—	Amount.
Chile	$2,597	France	$1,606
British East India	2,026	Europe, Turkey	1,252
Mexico	778	Denmark	1,743
Russian Asia	528	Other countries	2,220
Great Britain	261,305		
Sweden	42,440		325,820
Norway	9,320		

HARD RUBBER GOODS.

United States	$60,107	Central America	$2,739
Australia	24,940	Cape	1,054
British East India	20,720	Great Britain	162,663
Venezuela	17,907	Spain	32,972
Mexico	16,496	Norway	17,290
Argentine Republic	16,110	Belgium	6,837
Brazil	14,087	Portugal	5,150
Chile	10,365	France	3,640
British North America	8,518	Sweden	1,746
Colombia	7,563	Denmark	678
Philippine Islands	4,602	Other countries	6,242
Uruguay	4,096		
Japan	3,505		450,027

OTHER RUBBER GOODS.

United States	$146,172	British North America	$397
Argentine Republic	59,052	Siam	821
Japan	23,060	Cuba	99
Chile	19,002	Great Britain	414,510
Australia	17,255	Spain	50,620
Brazil	15,782	Norway	35,510
Central America	11,681	Portugal	16,472
Uruguay	11,095	Sweden	9,884
British East India	8,960	Italy	5,397
Mexico	12,314	Baltic Russia	1,970
Venezuela	6,514	France	1,361
China	6,250	Denmark	1,242
Peru	4,022	Belgium	1,187
Singapore	3,777	Bremen	892
The Cape of Good Hope	2,532	Other countries	7,282
Colombia	1,661		
Philippine Islands	1,440		900,327
Ecuador	914		

RUBBER EXPORTS TO THE UNITED STATES.

The exports of raw rubber and rubber goods from this district to the United States for the first nine months of 1890 amounted to the following:

Raw rubber	$42,690.28
African rubber	7,628.15
India rubber	368,544.24
Total	418,862.67
Gum substitute	615.39
Old rubber shoes	208.93
Dental rubber	6,429.61
Gutta percha	58,353.22
Rubber goods	53,501.43
Grand total	538,001.25

IMPORTS OF RUBBER GOODS.

There were imported in 1889 into Hamburg the following amounts of manufactured rubber goods:

From—	Rubber shoes.		Hard rubber goods.	Other rubber goods.
	Pairs.	Value.		
United States	5,746	$2,528	$6,843	$26,480
Great Britain	87,067	35,260	6,833	360,194
Belgium	1,760	838		
France			293	22,258
Portugal	2,747	573		595
Russia (Baltic)	53	29		
Other countries	213	158	293	1,062
Total	98,186	39,385	14,262	410,589

AMERICAN RUBBER GOODS.

American rubber goods are looked upon very favorably in this city, but are regarded as rather too high in price. In my opinion the best way to extend the trade of American rubber manufactures in this country would be to establish permanent agencies in this city and the other commercial centers of Germany, providing them with full lines of samples.

This is the way the manufacturers of other countries conduct their business here.

UNITED STATES CONSULATE,
Hamburg, December 16, 1890.

CHAS. F. JOHNSON,
Consul.

MANNHEIM,

REPORT BY CONSUL WINTER.

India rubber in its crude state is imported into this country from the region of the Amazon in Brazil.

MANUFACTURES.

The manufacture of India rubber into its various forms of commercial use is assuming large proportions in Mannheim within the last few years.

There are already three or four manufacturing establishments in this consular district, situated in Mannheim and vicinity.

All sorts of soft and hard rubber goods are manufactured in these factories, consisting of cloth, boots and shoes, hose, belting, valves, sheets, packing, tubing, matting, hard rubber for surgical and electrical purposes, toys, combs, elastics, etc.

The amount of India-rubber goods manufactured per year in Mannheim and vicinity will now average in value $1,000,000. The most of these goods are intended for home consumption.

The export is not very important up to the present time, and goes to England, Italy, Spain, and the Danubian countries.

The United States takes some hard rubber goods for surgical purposes, combs, etc., but to no great extent.

One of the leading manufacturing establishments of India-rubber goods in Mannheim is an American company having a branch manufactory in Paris, France.

I am under obligation to the Mannheimer Gummi Gutta-percha and Asbest Fabrik, of Mannheim, for some facts in connection with the India-rubber industry.

But all these establishments decline to furnish me price lists, assigning reasons that articles manufactured are too various to mention, etc. I have taken occasion to price India-rubber boots and shoes, and find the prices range as follows:

Men's rubber shoes:	
With indented heels	$0.75 to $1.00
With plain heels	.50 to .85
Ladie's rubber shoes:	
With indented heels	.60 to .75
With plain heels	.50 to .70
Children's rubber shoes:	
With indented heels	.40 to .60
With plain heels	.30 to .50

Men's India rubber boots ranging in price from $1.75 to $3.25.

The style and finish of India-rubber shoes of German manufacture are not so elegant as the best articles of American manufacture, but they are serviceable.

As a rule there is no royal road leading to fortune in the commercial world. Competition is now too great. The same intelligence, industry, and perseverance that is exercised by our successful merchants and manufacturers at home will succeed in extending their trade into wider fields abroad.

That can be done by establishing branch houses and reliable agencies in foreign countries, and by equipping their brightest commercial travelers, who can speak the language of the country to be visited, with samples of their products and price lists, and where connections are established hold them by fidelity and promptness, and by conforming to the peculiar customs of commerce and trade that may obtain in the country where their goods are in demand.

JNO. F. WINTER,
Consul.

UNITED STATES CONSULATE,
Mannheim, January 29, 1891.

MUNICH.

REPORT BY CONSUL CATLIN.

It was only a few days ago that I succeeded in obtaining the rather meager information to be found below. The manufacturers and firms here are not disposed to give any information about their business unless they think it will be to their personal advantage to do so.

There are four firms engaged in the manufacture of India-rubber goods in Munich, and besides these there are about two dozen shops or stores in which articles manufactured of rubber are sold. One of these sells only the goods of a Berlin manufacturer.

As to inquiry No. 11 of the circular, I can give no figures in regard to the extent of the goods produced. The character of the goods produced will appear from the following enumeration of the various kinds and descriptions of rubber articles manufactured here, viz:

Air-proof goods, pillows, cushions, water-beds, enameled bottles and enemas, ice-bags, baths, seamless mineralized India-rubber and canvas hose, India-rubber tubing (delivery and suction) for wine, breweries, water, gas, steam and acids, machine belting (supercotton canvas and India rubber) valves, sheet, joints, washers, buffers, springs, steam-packing, hat-pressing bags and rings, gas-bags, bottle-stoppers and washers for bottle-stoppers, cycle and wheel tires, mineralized molded strips for billiard purposes, etc., enameled balls for perfumed sprays, etc.; mats, punched, corrugated, and in various designs, royal aromatic red mineralized bands and rings, ink and pencil erasers, tobacco pouches, waterproof garments and fabrics, bed-sheeting, teats and feeding-bottles, and the other articles referred to in the price lists sent herewith.

These goods are exported, as I am informed, to all European countries, except Austria-Hungary, England, and Italy, and occasionally to transmarine countries. The extent of the export I am not able to state.

I do not think that foreign manufactures of rubber are used to any considerable extent here, as every variety of the manufactured article is produced by the native manufacturers.

I have not been able to ascertain that any rubber goods imported from the United States are sold here.

F. W. CATLIN,
Consul.

UNITED STATES CONSULATE,
Munich, February 14, 1891.

NORTH GERMANY.

REPORT BY CONSUL-GENERAL EDWARDS, OF BERLIN.

India rubber enters into the manufactures of this district to a considerable extent.

The goods manufactured here are hard rubber technical and surgical wares.

Rubber clothing, boots and shoes, hose, belting, and other classes of goods made of rubber, except those above mentioned, are not manufactured here.

The wares manufactured here are exported to all parts of the world.

Price lists of manufacturers are not obtainable.

I am not able to state in detail the extent of the importations of manufactures of rubber in this district.

The statistical statement which accompanies this report will show the total importations of the German Empire for the first half of the year 1890, as compared with the corresponding period of 1889, of raw and manufactured rubber.

England sends to Germany large quantities of technical goods.

Russia sends to Germany large quantities of boots and shoes.

A reference to the statistical statement referred to above will show the extent of the importations from the United States.

I regret to say that I am not able to specify in detail the amount and value of the rubber clothing, boots and shoes imported from the United States.

A large business could be done by the American manufacturers of rubber shoes in Germany, provided the manufacturers would show proper attention to the tastes and long-established customs of the German people.

The wall which constitutes the grand difficulty in the way of almost every American manufacturer in his efforts to reach this market is prejudice.

American manufacturers almost invariably try to persuade every foreign purchaser that each article of wearing apparel, from the waterproof clothing to the overshoe, should have a certain amount of style about it.

What is commonly regarded by the American manufacturer as "style" is with many Germans irreconcilable with usefulness, and it very frequently happens that the foreigners are unjust and unwise enough to regard a certain amount of "style" or finish in such articles as a strategem or trick which is resorted to to dispose of inferior wares.

The prejudice of the North German in favor of the heavy, clumsy boots and shoes which he buys from Russia is quite as strong as that of the American manufacturer in favor of his light, stylish, well-finished boot and shoe.

Russia commands and controls this market in rubber boots and shoes simply because the demands of the North German are about the same in this line as the Russian.

Attention to the tastes of the North Germans is absolutely indispensable to success in this market—in the shoe trade.

American manufacturers pay too much attention to the cut, style, and finish of their products, and too little attention to the foreign prejudice which exists in favor of another class of goods.

If American manufacturers are to secure a fair share of the North German trade in rubber boots and shoes they must try to satisfy not only the tastes of the North Germans but also meet the requirements of the climate of North Germany.

What is, therefore, very urgently wanted by every American manufacturer who desires to enjoy the benefits of the German trade in rubber ware, such as clothing and boots and shoes, is a more definite knowledge of the tastes of these people and the conditions of the climate of this section.

All attempts to build and advance a trade upon any other basis will fail.

W. H. EDWARDS,
Consul-General.

UNITED STATES CONSUL-GENERAL,
Berlin, December 4, 1890.

GERMAN RUBBER TRADE IN 1890.

[Inclosure in Consul Edwards's report.]

The further we advance in the year 1890 the more interesting become the rubber statistics of different countries, and especially of Germany. In the month of May there was a considerable fall in the export and import both of raw and manufactured rubber, but in June there was a rise in both. The following table shows the figures for June, 1890, and June 1889:

Raw and manufactured rubber and gutta-percha.

From or to—	Import (kilograms, net).		Export (kilograms, net).	
	June, 1889.	June, 1890.	June, 1889.	June, 1890.
Former free ports	1,000	.....	6,400	38,500
Belgium	2,100	7,000	200	.....
France	18,100	17,100	.....	100
Great Britain	173,300	112,800	8,500	19,200
Holland	1,300	5,100	800	.....
Italy	.....	.....	.....	3,500
Norway	.....	.....	600	.....
Austria-Hungary	1,300	500	900	3,900
Russia	1,700	23,000	32,000	20,100
Switzerland	300	200	.....	100
Spain	.....	.....	200	.....
British India	20,000	37,600	.....	500
Brazil	13,400	34,500	.....	.....
United States	1,300	10,800	3,900	24,400
Morocco, etc	31,000	33,100	.....	.....
German West Africa	32,500	22,900	.....	.....
East Africa	4,100	.....	.....	.....
Other countries	.....	20,400	300	100
Total	301,400	325,000	53,800	110,400
Increase, 1890	23,600 kilograms.		56,600 kilograms.	

The changes shown by this table are a falling off of the importation from England of 60,500 kilograms, German West Africa 9,600, France 1,000, Austria-Hungary 800, and Switzerland 100 kilograms. On the other hand there was an increase from Russia of 21,300, Brazil 21,100, other countries 20,400, the United States 9,500, British India 17,600, Belgium 4,900, Holland 3,000, Morocco and foreign West Africa 2,100 kilograms. From this it appears that the importation from British India materially increased.

In the export, with the exception of the former free ports, England, Russia, and the United States showed the most increase or decrease. To England it increased 10,700 and to Russia it decreased 11,900. To the United States it increased 20,500 kilograms. The total importation of the first half of 1890 as compared with the corresponding period of 1889 shows a small fall, and the export a slight increase.

Raw and manufactured rubber and gutta-percha.

From or to—	Import (Jan. 1 to June 30), kilograms, net.		Export (Jan. 1 to June 30), kilograms, net.	
	1889.	1890.	1889.	1890.
Former free ports	78,100	400	52,600	56,700
Belgium	14,600	23,600	1,100	9,900
Denmark	200	1,400	.....	.....
France	113,800	73,200	2,800	6,000
Great Britain	1,228,000	919,100	60,300	85,500
Italy	200	.....	100	3,500
Holland	51,000	77,200	2,600	4,600
Norway	.....	10,600	1,000	.....
Austria-Hungary	13,000	4,100	37,800	23,200
Roumania	.....	800	.....	100
Russia	13,300	65,400	103,600	92,000
Sweden	600	2,600	1,100	400
Switzerland	1,900	1,200	400	600
Spain	.....	500	600	300
British India	72,700	101,000	100	500
Argentine Republic	.....	.....	300	100
Brazil	56,500	154,700	100	.....
United States	20,100	20,400	65,800	87,300
Morocco and West Africa	.....	336,000	.....	.....
Other countries	382,900	207,700	1,100	100
	2,046,900	1,999,900	340,400	370,800
Difference, 1890	—47,000 kilograms.		+30,400 kilograms.	

The chief change was a falling off of 308,900 kilograms in the import from England, while the German export to England increased 16,200 kilograms. The other changes can be easily seen from the table.

As compared with 1888 both of the succeeding years showed an increase, the imports in the corresponding period of 1888 amounting to 1,477,300 and the export to 48,600 kilograms.

MANUFACTURE OF AND TRADE IN RUBBER GOODS.

The situation of the rubber ware manufacturing industry improved in the year 1889, as compared with the preceding year, owing to the increased demands of the technical branches which are connected with the rubber branch of trade. The increased competition of the factories, however, did not admit of an improvement in sale prices, as the production was increased in order to keep up with the sales.

The export trade remained practically unchanged, as while Russia and Austria, in consequence of high tariffs, were almost entirely lost, they were replaced by America and Australia. The tendency of the raw rubber market at the end of the year 1889 was steady and encouraging to the hope that the time was not far distant when the factories could make a general rise of prices. England still continues to control the largest portion of the raw rubber import trade. Hamburg and Bremen, it is true, import direct, but are not able to supply the entire German demand and regularly regulate their prices in accordance with English quotations.

It is hoped that the development of the German colonies and the already subsidized steamship line will in time materially increase the direct importation of raw rubber, especially from Africa, the continent of second importance in the production of raw rubber.

NUREMBURG.

REPORT BY CONSUL BLACK.

India rubber does not enter into the manufactures of this consular district. It is impossible to obtain the exact amount of the yearly importation of manufactures of rubber into the limits of this consulate, as no statistics are given out by the customs authorities here. Their figures are only kept upon loose sheets, which are, at the end of every two weeks, forwarded to the central statistical bureau at Berlin, where they are compiled with those of the whole Empire.

Even if the figures from here were obtainable, they would not indicate the full amount of these wares brought here from foreign countries, for very often articles destined for this city are entered at German seaports.

So far as I have been able to learn, sheet rubber and rubber in pieces, which are almost if not entirely the product of the United States, constitute the bulk of the rubber goods imported directly into the city of Nuremberg. The value of these goods brought here the past year may be safely estimated at $20,000. They are worked up into pencil and ink erasers.

The imports of rubber bands from the United States aggregate no small amount, however, and I am confident that I do not overestimate the value of last year's receipts in declaring that the amount reached $5,000.

Importation of other rubber goods are insignificant, and I do not think any of them are direct. They are usually purchased from agents of American houses or importing firms in the large cities of North Germany. The field here for this trade is not sufficiently extensive to warrant direct orders. By the retail trade French rubber toys are brought in small quantities, preference being given them over others because of their more attractive finish.

Rubber coats and shoes are, as a rule, of German make. Some few, however, are of English production, and shoes from Russia are also sold to a limited extent. American goods of this character are but seldom seen here.

The feeling largely predominates among the manufacturers with whom I have spoken that the American sheet rubber and rubber in pieces used in making ink and pencil erasers is the best manufactured; that for durability, effectiveness, and quickness in performing its work without destroying the paper it has no equal, and its increased cost over that of the productions of other countries is fully offset by its superior quality.

Rubber shoes of American manufacture appear to have been offered here from time to time for sale by retail dealers. They say, however, that they are too light and do not last as long as the heavy ones of the German and English make; besides that, they are more expensive. I think the last reason is the prime factor in preventing their introduction.

My inquiries lead me to conclude that there is not at the present time any chance of extending our rubber trade in this district.

WM. J. BLACK,
Consul.

UNITED STATES CONSULATE,
Nuremberg, December 6, 1890.

GERMAN RUBBER TARIFF—TRANSLATION.

[Inclosure in Consul Black's report.]

Extract from the German tariff laws.

(*a*) India rubber and gutta-percha, crude or cleaned, hard rubber, also polished or stamped with some design, in sheets, sticks, tubes, etc.		Free.
		Marks.
(*b*) India-rubber threads, not in combination with other materials or overspun with cotton, linen, or wool, or raw (unbleached or without dye) yarn in such a way as to make it impossible to distinguish the rubber; dissolved rubber in sheets	per 100 kilos..	3
(*c*) Coarse goods of soft rubber, unvarnished, without dye; unprinted goods out of hard rubber; all these goods also in combination with other materials; overspun India-rubber strings	per 100 kilos..	40
(*d*) Fine goods out of soft rubber, varnished, dyed, printed, or impressed with some design; all these goods also in combination with other materials,	per 100 kilos..	60
(*e*) Textile fabrics of all classes, lined or saturated with India rubber or held together by layers of India rubber, or with inserted India-rubber threads; textiles of India-rubber threads in combination with other spun materials; hosiery and small ware in combination with India-rubber threads,	per 100 kilos..	90
(*f*) Hose out of hemp, belting for machinery, carriage coverings of coarse materials, in combination with India rubber	per 100 kilos..	24

Chemnitz.—No manufactories which produce either hard or soft rubber goods are in existence in this district. A careful search through the records of the local custom-house by the chief customs officer here would indicate that rubber goods are not imported direct into Chemnitz from the United States nor from other countries outside of Germany.

American-made goods stand high in the appreciation of local dealers, but are not handled as extensively as those made in England or Germany on account of the difficulty experienced in getting American goods and a difference in the cost.

If permitted, I would suggest that in order to increase the demand for and consumption of American rubber goods branch houses be established in the principal cities in Europe on the same plan as in America. (H. F. Merritt, consul, Chemnitz, January, 1891.)

HOLLAND.

REPORT BY CONSUL GARDNER, OF ROTTERDAM.

CAOUTCHOUC IMPORTS.

Caoutchouc, or India rubber crude, is imported into the Netherlands free. Manufactures of rubber of every description pay a duty of 5 per cent.

The imports during the calendar year 1889 were as follows, crude being reported by quantity, and the manufactured product by its value, of necessity:

Crude rubber from—	Pounds.
Africa, east coast	1,364
Africa, west coast	1,489,484
Belgium	6,019
France	36,062
Great Britain	630,557
Germany	37,776
The East Indies	27,186
Portugal	217
Total	2,228,667

Of this total Netherlands import, 2,145,000 pounds were received at the port of Rotterdam.

THE EXPORTS OF CAOUTCHOUC.

The exports during the calendar year 1889 were as follows, the quantities in the table below as in the table above being given in pounds avoirdupois, and values in the currency of the United States:

Crude rubber to—	Pounds.
Belgium	13,312
Great Britain	210,905
Germany	213,475
Italy	22,715
The East Indies	950
Russia	299,262
The United States	285,932
Total	1,046,551

Of this last-named total, 523,600 pounds were shipped from the port of Rotterdam and 486,200 pounds from the port of Amsterdam.

IMPORTS OF RUBBER GOODS.

Manufactured rubber goods from—	
Belgium	$334.80
Great Britain	2,200.80
Germany	15,959.20
Russia	398.40
Total	18,893.20

No manufactures of rubber whatever are exported from the Netherlands.

FACTORIES IN THE NETHERLANDS.

There are in the Netherlands only three small establishments for making rubber goods: one each at Haarlem and Amsterdam, in North Holland, and one at Riddersteck, near Rotterdam, in South Holland. Their present total annual consumption of crude material is but 110,000 pounds. Their manufactures are principally belting, hose, and mats. Neither boots nor shoes are made. They produce for home consumption exclusively.

The imports of manufactured rubber into this country, as shown by the second table above, are in great part from Germany; and Hanover, Germany, is the present chief source of supply. So far as I am able to obtain information, no rubber goods are imported by the people of the Netherlands from the United States.

THE TRADE IN CRUDE RUBBER.

The Netherlands trade in crude rubber is striking in its extent as compared with the traffic in manufactured stock, solely because here is the home of West Africa trading companies, who make of these Dutch cities primary markets for every description of African goods. The disparity shown above in the amount of crude rubber imported and the amount exported and consumed during the year 1889 furnishes a good illustration of the extent to which Netherland cities are made mere storage depots of vast mercantile supplies. At the present time the amount of crude rubber in this country is large, fully 300,000 pounds being held by dealers in the city of Rotterdam alone.

A TRADE TO BE YET DEVELOPED.

Ignorance of the cost of producing rubber goods in the United States and of their market values in the Netherlands precludes any specific suggestion as to methods of extending American trade in this direction. This sea-encompassed country is preëminently the region of copious rains and abundant water. Every description of rubber clothing and rubber boots and shoes would seem to be in demand. What has been already written tends to show, however, that present sales of these articles are hardly more than nominal. If American manufacturers can place their goods in the Netherlands markets at prices to compete with Germany, then a field of trade of large extent is here waiting to be occupied.

WASTE IN RUBBER-PRODUCING REGIONS.

Merchants in Rotterdam who are handlers of rubber inform me that in the markets of Europe, not less than in those of the United States, there are apprehensions regarding the wanton waste in rubber-produc-

ing countries. They cite the fact that exports of caoutchouc from P have increased from less than 5,000 tons in 1870 to more than 15, tons in 1888, and are steadily growing; as is also the export trad the African west and east coast. They also agree that the method securing the gum, so far as they are informed, are everywhere u lessly destructive of the trees and plants. Still, despite the multi ing uses to which rubber is put, they do not seriously anticipate early diminution of supply; the producing regions, they state, b as yet of incalculable extent.

WALTER E. GARDNER,
Cons u

UNITED STATES CONSULATE,
Rotterdam, October 22, 1890.

ITALY.

ITALIAN DUTIES ON RUBBER.

Crude rubber, free of duty.

Rubber sawn from sheets, or in articles of sawn sheets, duty, 60 lire per 100 kilometers.

Rubber thread, duty, 75 lire per hundred kilometers.

In other stock, including hard caoutchouc but excluding the work of elastic gum mixed with woven goods or metals, duty, 50 lire per 1 kilometers.

In tubes and sheets containing metal thread or metal cloth, duty, lire per 100 kilometers.

Mixed to woven articles of whatever kind except gummed w cloth and wearing apparel, duty, 60 lire per 100 kilometers.

Worked in laces, ribbons (belts), and elastic woven goods, dut and 130 lire per 100 kilometers.

Gummed articles, such as wearing and traveling apparel, are s to the duty of the woven goods.

Catania.—There is neither production nor manufacture of r my district.

There would seem also to be little benefit to American merc try and introduce manufactured rubber in this district, as the is very small, rubber goods being but little used.

The total imports for 1889, as below, amounted to only (Charles Heath, consul, Catania, December 4, 1890.)

FLORENCE.

REPORT BY CONSUL DILLER.

No India-rubber goods are imported into this district from the United States.

The quantity of such goods imported from England, France, and Germany is very small, owing to the high rate of duty levied on the finer grades of such goods by the Italian Government. The duty on elastic tissues, bands, ribbons, braids, etc., amounts to $22.30 per 220.46 pounds.

On articles of clothing, foot-wear, tubes, hose, etc., $6.18 per 220.46 pounds.

There is no duty on crude rubber and no export duty on the manufactured article.

There are extensive manufactures of rubber goods at Milan, Turin, and Narni, and nearly all such goods found in this market are produced there.

The secretary of finance is empowered in certain cases and under certain clauses and conditions, to grant at his discretion, free entry to certain tissues for the use of Italian manufacturers of rubber goods for their exclusive benefit, to the value of not over 100,000 lire or $19,300. This privilege, in my opinion, is to secure the best description of samples of such goods manufactured abroad for the use of the army and navy.

I have therefore no suggestions to offer for the benefit of American rubber manufacturers in this district.

ISAAC R. DILLER,
Consul.

UNITED STATES CONSULATE,
Florence, Italy, November 10, 1890.

GENOA.

REPORT BY CONSUL FLETCHER.

There are no establishments for the manufacture of rubber goods in this consular district.

According to the report of the chamber of commerce for the year 1889, given to the public October 16, 1890, there was exported from Genoa last year 26,271 kilograms of rubber goods, valued at 235,218 lire. This merchandise was undoubtedly manufactured at the large India rubber establishment at Milan and sold abroad through the company's agents located in this city.

The purchasers were—

	Kilos.
Argentine Republic and Chile	15,749
Turkey in Europe	3,707
Egypt	70
France	3,977
Spain	2,768
Total	26,271

The report of the chamber of commerce referred to elsewhere gives the importations of crude rubber and rubber goods as follows:

Importations.

	1888.		1889.	
	Quantity.	Value.	Quantity.	Value.
	Kilos.	*Lire.*	*Kilos.*	*Lire.*
Crude rubber	142,008	1,060,000	243,168	1,702,176
Manufactured rubber	23,012	230,000	21,159	157,486

The above figures show a falling off of 1,853 kilograms in 1889 as compared with 1888, in manufactured goods, and an increase of 101,160 kilos of crude rubber in 1889 over 1888.

Crude rubber was imported in 1889 from—

	Kilos.
England	236,736
Germany	5,752
British colonies (Asia)	680
Total	243,168

Manufactured rubber goods were imported in 1889 from—

	Kilos.
Austria	907
England	5,736
France	551
Germany	11,215
United States	2,750
Total	21,159

Out of the 243,168 kilograms of crude rubber brought to this port in 1889, 85 per cent thereof was sent to the large rubber manufacturing establishment at Milan, and the balance to the small factories at Rome and Turin.

Inquiry has failed to discover that comparisons have been made by dealers between rubber goods manufactured in the United States and similar goods from other countries. Dealers buy their wares of the firms who sell cheapest, without regard to the country in which they are manufactured. It is well to state here that rubber boots and shoes are scarcely ever worn by the people in this consular district.

A glance at the figures given above will show that Germany furnished more than one-half of all the rubber goods imported into Genoa last year. This undoubtedly was owing to the fact that representatives of German houses thoroughly canvassed this district in the interest of their employers.

To compete, then, with European houses, American manufacturers should be represented here also, and not only this, but said representatives should also be prepared to sell their wares as cheaply as their European competitors.

I must state that the styles or quality of the rubber goods imported to and exported from Genoa can not be ascertained by any, or in any, published statistics.

By reducing prices and quantity as given elsewhere in this report, the following items are obtained: Imported rubber goods, 7.44 lire per kilogram; exported rubber goods, 8.95 lire per kilogram.

JAMES FLETCHER,
Consul.

UNITED STATES CONSULATE,
Genoa, November 18, 1890.

LEGHORN.

REPORT BY CONSUL RICE.

CAOUTCHOUC AND RUBBER.

The importation of India rubber into this district during the year 1889, worked up into different uses and forms, produced a grand total of 8,681 kilograms, or 19,144 English pounds, from the following places: One thousand kilograms came from Asia, 6,028 from England, 378 from Austria, 995 from France, and 280 from Germany, the whole being valued at $14,358.43.

MANUFACTURES.

No rubber goods are imported from the United States.

No American rubber goods being imported into this consular district, no comparison can be made.

So many similar requests have been made at this consulate for suggestions to introduce this or that article of American manufacture upon the Leghorn market that I can only offer for the benefit of the American rubber manufacturers the establishment of agencies with samples and prices.

WILLIAM T. RICE,
Consul.

UNITED STATES CONSULATE,
Leghorn, December 1, 1890.

MILAN.

REPORT BY CONSUL PEPPER.

No India rubber is produced in this district. There has been no effort made, as far as I can discover, to cultivate it, and I have been informed by reliable persons that it would not be profitable to try it, as it would not be successful. The questions as to manufactured goods I answer in the following order:

All kinds of India-rubber manufactured goods have been established

in this city for nearly twenty years, but it is only within eight or ten years that they have become extensively known. There is here in Milan a factory which employs 1,400 persons. There are several million francs invested.

This factory supplies more than four-fifths of the demand. The exportations go to Germany, Spain, South America, Roumania, Asia, and Africa. The proprietor of the factory referred to has built a cable from Brindisi to Africa.

Crude rubber is not imported to any extent, but what there is pays no duty.

The importations of manufactures of rubber in our district extends to scarcely one-fifth of the demand; they come from Germany, England, and a small quantity from France, especially boots and shoes, which the manufacturers do not find it profitable to make.

There are no India-rubber goods imported from the United States in consequence of their being superior in quality.

Shoes pay 2 francs each pair duty. Piece goods pay according to the textile—namely, if silk, the duty is correspondent. Gutta percha goods—such as hose, tubes, and similar articles—pay from 40 to 90 francs per 100 kilograms weight.

I believe the opinion is entertained by many that American goods are of a very superior quality.

I do not think it would be best, for reasons stated and suggested in the above replies, for Americans to extend their operations into this part of Italy.

GEO. W. PEPPER,
Consul.

UNITED STATES CONSULATE,
Milan, October 29, 1890.

PALERMO.

REPORT BY CONSUL CARROLL.

Statement showing the quantity and value of India rubber imported into the port of Palermo, together with the countries whence it was imported, during the last five years, beginning January 1, 1885, and ending December 31, 1889.

[Quantity given in kilograms.]

Whence imported.	1885.		1886.		1887.	
	Quantity.	Value.	Quantity.	Value.	Quantity.	Value.
Austria	2,298	$4,379.00	978	$2,476.40	3,570	$6,019.80
France	4,178	11,177.40	3,639	9,847.80	2,217	5,728.40
Germany	2,506	5,120.00	776	1,400.00	2,914	5,279.40
Great Britain	972	1,506.00	66	240.00	1,503	2,118.80
Holland	.....	.....	.....	.....	180	300.00
Switzerland	.....	.....	.....	.....	.....	.....
United States	.....	.....	.....	.....	63	101.60
Total	9,954	22,182.40	5,459	13,964.20	10,447	19,548.00
Duty collected thereon	.....	1,507.20	.....	1,261.00	.....	859.80

Statement showing the quantity and value of India rubber imported into the port of Palermo, together with the countries whence imported, etc.—Continued.

[Quantity given in kilograms.]

Whence imported.	1888.		1889.		Total.	
	Quantity.	Value.	Quantity.	Value.	Quantity.	Value.
Austria	847	$1,323.40	56	$78.40	7,749	$14,277.00
France	806	2,122.20	259	420.00	11,099	29,295.80
Germany	3,371	8,200.00	1,501	2,803.00	11,068	22,802.40
Great Britain	488	683.20	.....	.....	3,029	4,548.00
Holland	90	214.00	.....	.....	270	514.00
Switzerland	2,743	7,294.60	3,582	9,142.00	6,325	16,436.60
United States	.....	.....	.....	.....	63	101.60
Total	8,345	19,837.40	5,398	12,443.40	39,603	87,975.40
Duty collected thereon	.....	1,666.60	.....	1,425.60	.....	6,720.20

Statement showing the quantity and value of India rubber imported into Palermo, together with the countries whence imported, during the five years from 1885 to 1889, inclusive.

[Quantity given in kilograms.]

Whence imported.	In sawed leaves and sawed objects thereof.		In other forms, comprising hard caoutchouc, exclusive of India rubber works mixed with tissues and metals.		In tubes and leaves containing metallic tissues or wires.	
	Quantity.	Value.	Quantity.	Value.	Quantity.	Value.
Austria	121	$240.00	4,955	$7,537.00	.....	.....
France	13	110.00	847	1,185.80	.....	.....
Germany	1,299	3,880.00	5,713	8,996.40	.....	.....
Great Britain	19	80.00	2,910	4,004.00	.....	.....
Holland	16	94.00	254	420.00	.....	.....
Switzerland	.....	.....	.....	.....	171	$119.00
United States	.....	.....	63	101.60	.....	.....
Total	1,468	4,404.00	14,742	22,244.80	171	119.00
Duty collected thereon	.....	176.00	.....	505.40	.....	13.60

Whence imported.	Mixed with tissues in works of any material, excepting gum tissues in pieces and cloths.		Worked in lace for liveries, trimmings, etc., in elastic bands and tissues.		Total.	
	Quantity.	Value.	Quantity.	Value.	Quantity.	Value.
Austria	409	$500.00	2,264	$6,000.00	7,749	$14,277.00
France	.....	.....	10,239	28,000.00	11,099	29,295.80
Germany	691	726.00	3,365	9,200.00	11,068	22,802.40
Great Britain	.....	.....	100	464.00	3,029	4,548.00
Holland	.....	.....	.....	.....	270	514.00
Switzerland	.....	.....	6,154	16,317.60	6,325	16,436.60
United States	.....	.....	.....	.....	63	101.60
Total	1,100	1,226.00	22,122	59,981.60	39,603	87,975.40
Duty collected thereon	.....	542.40	.....	5,482.80	.....	6,720.20

PHILIP CARROLL,
Consul.

UNITED STATES CONSULATE,
Palermo, December 19, 1890.

PORTUGAL.

REPORT BY VICE-CONSUL GENERAL WILBOR, OF LISBON.

There is no caoutchouc produced in Portugal. The exports of crude rubber in 1888 were:

Germany	$1,028,620
France	60,564
Holland	24,700
England	407,066
United States	215,177

There is no export duty on crude rubber, nor is there rubber manufactured in Portugal.

IMPORTS.

Crude rubber is free of duty.

There were imported in 1888 of manufactures of caoutchouc $48,600 worth, of which $448.20 was direct from the United States.

Duty on importation of manufactured caoutchouc in elastic tissues of silk, $1.77 a kilogram; other tissues, 89 cents a kilogram; tubing, 21 cents a kilogram; manufactures not specified, 54 cents a kilogram.

American rubber goods are favorably considered, but very dear.

I would suggest a reduction in price and the offering of as advantageous terms of credit as are given by continental and English houses as the best means of building up American trade.

J. B. WILBOR,
Vice-Consul General.

UNITED STATES CONSULATE-GENERAL,
Lisbon, October 31, 1890.

RUSSIA.

REPORT BY CONSUL-GENERAL CRAWFORD, OF ST. PETERSBURG.

In obedience to instructions contained in the Department's India-rubber circular of September 20, 1890, I have to report that I have gathered and give below all the data of official character obtainable touching the question. There seems to be great secrecy as to the output of the different factories in Russia as well as in their systems of working.

There are in all three large India-rubber factories in this Empire, namely:

The "Russian-American India-rubber factory" in St. Petersburg, which is undoubtedly the largest of the kind in the world. Its directors and shareholders are all German, and although it does business under the name of Russian-American, yet neither of these countries are represented by any capital in the concern. This factory does an enormous business, but the company refuse any detailed information.

The second factory is that doing business under the name of "Provodnik," situated in Riga. Its directors are Frenchmen. It has a capital of nearly half a million dollars and has been at work about a year and a half. Its output in the first year amounted to about $500,000 worth of rubber clothing, hose, belting, surgical goods, linoleum, etc. It has lately begun manufacturing rubber shoes, and intends exporting the surplus to Germany and the Scandinavian countries. In former years, in Riga, market was supplied with rubber goods through England and Germany. The "Provodnik" factory was destroyed by fire on November 1, 1890, only the engines, boilers, and the building where linoleum is manufactured remained uninjured. It is said that the latest improvements in the shape of machinery, tools, and buildings will be placed in the new factory which this company is now building, and as the directors are Frenchmen it is most likely that all improvements will be imported from France.

The third factory in this branch of industry is situated in Moscow. Its directors and capital are German, and it is altogether dependent on the factory in St. Petersburg.

The Moscow factory was founded in 1887 with a capital of $300,000, and it obtains, like the others, most of its raw material from England.

Besides these three factories there are five smaller ones in Moscow, which manufacture exclusively shoe-webbing, in quantities sufficiently large to supply the Moscow and the provincial markets with the article.

By consulting the reports of the ministry of finance for the years 1883, 1886, 1888, and 1889, I have been able to make the following tabulations of imports and exports of India-rubber manufactures in the years above mentioned:

Years.	Exports.		Imports.	
	Tons.	Value.	Tons.	Value.
1883	.....	$215,470	3,030	$1,501,200
1886	402	341,355	.....	160,500
1888	655	659,850	153	130,630
1889	762	763,680	1,046	637,086

It must be remarked that there were no imports of manufactured rubber goods in 1889, or if there were they were not regarded sufficiently important to be separately classified. The 1,046 tons, representing a value of $637,086, imported in 1889 are classified under the heading of crude India rubber and caoutchouc in bladders and in liquid state.

Taking the years 1888 and 1889 separately, I find that in 1888—

The value of articles of India rubber and caoutchouc, with admixture of other materials, imported into Russia, amounted to	$117,752
Articles with admixture of other materials	20,265
Rubber clothing and hose	1,513
Rubber shoes	100
Total	139,632

The summary of rubber goods exported from Russia in 1888 was as follows:

Rubber shoes	$581,200
Various manufactures	78,650
Total	659,850

In 1889 the imports were classified as follows:

Frontiers through which the goods were imported.	Quantity.	Countries which supplied Russia with crude India rubber.	Quantity.
	Pounds.		*Pounds.*
Baltic ports	2,032,702	England	1,022,974
Russian-Prussian	47,520	Germany	604,368
Russian-Austrian	2,520	Portugal	309,612
Ports of the Black Sea	7,848	Holland	91,152
Azoff Sea	36	Austria-Hungary	2,520
Total	2,090,626	Total	2,090,626
Value	$637,086	Value	$637,086

The exports from Russia in 1889 were composed of rubber shoes, which were exported to Europe through the following frontiers and in the quantities shown below:

	Pounds.
Baltic ports	560,664
Russian-Prussian frontier	160,848
Russian-Austrian frontier	396
Roumanian frontier	5,328
From the Black Sea	48,924
	776,160
Exported to Finland	695,412
Exported to Asia	216
Total	1,471,788

which were valued at $735,558. These goods were sent to the following countries:

	Pounds.
Germany	641,124
Belgium	43,560
Denmark	34,956
Bulgaria	32,256
Turkey	12,816
Roumania	8,425

The amount of India-rubber manufactures sent to Europe in 1889, besides rubber shoes, was as follows:

	Pounds.
From the Baltic frontiers	576
From the Russian-Prussian	21,996
From the Russian-Austrian	3,096
From the Black Sea	2,952
	28,620
To Finland	23,544
To Asia	648
Total	52,812

The value of the manufactured goods exported amount to $27,822, and together with that of rubber shoes showed the total rubber exports to be $763,680.

It will be seen from the above tables that the imports have greatly decreased and that the rubber factories in the Russian Empire are on such a large scale that not only have they been able to supply the home demand, but have succeeded in a very short time in exporting the amount of rubber goods which Russia had imported in the previous years.

It will further be seen that the custom-house department did not specify separately the amount of raw material imported from that of manufactured goods until the year 1889. In that year the London market supplied about half the amount of crude material required by the Russian factories.

Most of the manufactured goods exported from Russia, rubber shoes especially, are sent to Germany, the remainder being shipped to Norway, Sweden, and to Roumania. Austria having a factory of its own, imports very little from Russia.

The "Russian-American India Rubber Factory," of St. Petersburg, makes a very high order of goods. The ordinary American rubber goods are not considered superior to those of Russian manufacture, and the high import duty renders it extremely difficult for foreign manufacturers to sell their goods in this Empire. However, the rubber cloths of foreign make are still imported, as that art is not understood by the local manufacturers.

Below will be found a list of duties on crude India rubber and its manufactures:

India rubber in its crude state, per 36 lbs	$0.20
Goods manufactured of India rubber, without the admixture of other materials, per 36 lbs	2.25
Goods manufactured of India rubber, with the admixture of other materials, per 36 lbs	4.07
India rubber clothing and hose, per 36 lbs	14.93
Rubber boots or shoes, with or without admixture of cloth or leather, per 36 lbs	6.79

It will be seen on examining this report that, although this industry is in its infancy in Russia, it is destined soon to take rank with that of other countries.

J. M. CRAWFORD.

UNITED STATES CONSULATE-GENERAL,
St. Petersburg, March 9, 1891.

POLAND.

REPORT BY CONSUL RAWICZ, OF WARSAW.

There exists no manufacture of goods made of these materials either at Warsaw or in the Kingdom of Poland, and in consequence of this caoutchouc or India rubber in a raw state is not imported. Most of the rubber goods which are sold in the shops here, as, for instance, galoshes, being here in great use, as well as all other rubber goods, are brought to Warsaw from St. Petersburg and from Riga, being manufactured in those cities. Imports in that branch from abroad to this country are quite insignificant, and consist in small fancy articles.

JOSEPH RAWICZ,
Consul.

UNITED STATES CONSULATE,
Warsaw, October 8, 1890.

SPAIN.

Spanish duties on rubber.—The following duties are those that are applicable to such goods as are imported into Spain from countries that are entitled to the advantage of the so-called "favored nation clause," the duties for other countries being from 20 to 25 per cent higher:*

Crude rubber, 3 pesetas per 100 kilos.
Rubber sheet, ¾ peseta per kilo.
Tubing, ¾ peseta per kilo.
Articles made from sheet, 1¼ pesetas per kilo.
Valves for machinery, $\frac{8}{100}$ peseta per kilo.
Rubber cloth, 2¾ pesetas per kilo.
Rubber cloth made up, 2¾ pesetas per kilo, plus 30 per cent.
Average rubber coat, 6 pesetas.
Rubber shoes, 1¼ pesetas per kilo.
Rubber shoes with leather soles, $5\frac{40}{100}$ pesetas per kilo.
Rubber bands, 1¼ pesetas per kilo.
Celluloid collars and cuffs, $\frac{65}{100}$ pesetas per kilo.
Toys, $1\frac{65}{100}$ pesetas per kilo.
Apparatus proved to be for benefit of Spanish industries, 8 pesetas per 100 kilos.

ANDALUSIA.

REPORT BY CONSUL TURNER, OF CADIZ.

I am unable to contribute much information in response to the rubber circular.

Imports.—The total amount imported into Spain for the nine months ended October 1, 1889, was 77,385 kilos, valued at 1,083,398 pesetas, for the same period of 1890 63,241 kilos, valued at 906,052 pesetas.

I am unable to state what part of it was raw material, but am sure that the greater part was in manufactured goods.

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*One peseta is equal to 19.3 cents; 1 kilogram, 2.2205 pounds; one meter, 1.094 yards.

I have not seen a rubber boot or overshoe in Andalusia, but the introduction of India-rubber wraps is well under way.

American rubber goods are not known here as such, all imports being made from England, France, and Germany. In investigating this subject I addressed letters to a large number of merchants of this city and Seville. The answers received are of the same tenor, so I content myself with inclosing but one, together with its translation. I also inclose a report from Consular Agent Catlin, of Huelva. I am sure that business could be done here if the American rubber manufacturers would send over men to work it up. It will not come unsolicited nor by the use of circulars published in a foreign language.

Andalusia is almost destitute of manufacturing industries, yet we sell her but a few manufactured articles, and chiefly, in my opinion, because we are not represented by agents and because communication between the two countries is almost entirely indirect. So far as I can learn there has been no attempt made in this district to cultivate rubber-producing plants of any kind.

Mr. Viniegra, the writer of the following communication, is one of the largest dry goods and general furnishing dealers in this province.

A few of the other merchants that replied to my queries named France as the country from which they bought their goods. But all, like the one quoted, knew nothing of the American production of any class of rubber goods.

R. W. TURNER,
Consul.

UNITED STATES CONSULATE,
Cadiz, November 29, 1890.

Mr. Viniegra to Consul Turner.

CADIZ, *November 4, 1890.*

MY DEAR SIR: I answer with pleasure your note of 1st instant, arranging my answers as you indicated, and confining myself to the only article that I sell, namely, "water-proof wraps:"

First. I sell gentlemen's and ladies' India-rubber water-proof wraps.

Second. The sale of these articles is increasing.

Third. I buy them only in Germany and England of two important commission houses, one in Hamburg and the other in Manchester. They deal in rubber goods on a grand scale and conditions.

Fourth. I am unacquainted with American rubber goods, and do not know how they compare with those of other countries.

Fifth. American articles would be acceptable in Spain if the English, German, and French styles of goods were followed.

Sixth. I can not give you a list of the rubber goods sold in Andalusia.

Seventh. I know of no manufactory of rubber goods in Spain.

Eighth. If the Americans, bearing in mind our customs duties, would compete for our trade, I think they could easily secure it, for the American articles sold in Spain are greatly liked; at least, this is true of the few that are sold in this city. This is all the information I can give.

Truly your obedient servant, etc.

D. VINIEGRA.

HUELVA.

REPORT BY CONSULAR AGENT CATLIN.

There is no rubber produced, nor are there any manufactures of rubber in this district.

The quantity of manufactures of this article imported was, in the twelve months from July, 1889, to June, 1890, 5½ tons, of the declared value of $1,120, and consisted almost exclusively of sheets and tubing and other forms for machinery and mining. The weight in coats and articles of clothing would not be more than a few hundredweight.

All the manufactures of rubber imported were from England and declared as of British origin, and I have no means of ascertaining whether any of them came originally from the United States.

JNO. R. CATLIN,
Consular Agent.

UNITED STATES CONSULAR AGENCY,
Huelva, November 5, 1890.

BARCELONA.

REPORT BY CONSUL BOWEN.

Caoutchouc or India rubber is not a product of Catalonia nor of any other part of Spain. Segregated specimens of the Brazilian caoutchouc tree, which belongs to the order euphorbiaceæ, are to be found in some of the public parks in Spain; but no effort has been made to treat it otherwise than as an ornamental exotic. The importations of rubber into Spain amount to about $125,000 a year, and of that amount $50,000 is the quota paid by this province of Catalonia, of which Barcelona is the capital. The raw material is imported from France and Belgium chiefly, and I might say exclusively, for the amount that comes from England is very insignificant. The manufactured goods, on the other hand, are principally English, although France, Germany, Italy, and the United also are bidding for Spanish favor. Two years ago there were no importations of rubber from the United States; but about fifteen months ago an invoice of waterproof clothing and of rubber boots and shoes was sent to Barcelona from Boston, the city in which Thomas C. Wales in 1825 conceived the idea of converting the Para overshoe as made by the Indians in Brazil into a rubber shoe of serviceable size and graceful shape, and in which rubber shoes are now made that at present are unrivaled in Spanish markets. During the last year $5,000 worth of these shoes have been sold in this province, and the demand for them is steadily increasing. The waterproof clothing, however, proved unsatifactory as compared with that of English make, and the demand for it consequently failed. In Barcelona, which supplies all the rest of Catalonia with crude and manufactured rubber, there are but five firms that are manufacturers of rubber, and even they produce only tubing and plain sheets, which, however, they put into the market at prices that practically forbid foreign competition. The machinery

employed by these firms is too antiquated to produce fancy articles that would compare favorably with those of foreign make, and therefore nearly all of the fancy goods are imported.

The inhabitants of Barcelona, who number 272,000, consume about one-half of all the rubber consumed in Catalonia, and substantially all of the fancy goods. The other cities, the towns, and the rural districts of Catalonia during the last year have sent comparatively large orders for rubber garments, and it is expected that their orders for the coming year will exceed, by far, the demand for the same articles by the people of Barcelona.

All of the five houses in Barcelona that are engaged in manufacturing rubber sell at wholesale and retail, but at prices that vary according to the quantity sold. In the most important house the prices stated are these:

		Pesetas.
Sheeting	per kilo	6.25 to 15.00
Valves for machines	do	8.75 to 15.00
Patent packing	do	7.50 to 10.00
Elastic cord	do	8.75 to 11.25
Cloth inlaid with rubber	per kilo	6.00 to 8.75
Rubber rings	do	7.50 to 11.25
Corks (conical and cylindrical)	per kilo	13.00 to 15.00
Straps	per kilo	12.00 to 16.00
Bed sheetings	each	9.00 to 10.00
Rings for pistons	per kilo	10.00 to 12.50
Gray, box rings	do	32.50 to 35.00
Rings for pipings	do	11.25 to 15.00
Tubes	do	.75 to 15.00
Hose	do	6.25 to 8.75
Billiard bands	do	14.00 to 16.00
Rubber cloth	per meter	1.25 to 4.95

In addition to the five firms referred to, the firm of Charles Macintosh & Co., limited, of Manchester, is represented in Barcelona, and also in Madrid, Bilbao, Seville, Valladolid, Malaga, Pamplona, Vitoria, Saragossa, Santander, and Oviedo. As a rule, this firm's wholesale prices are a little higher than those of the Spanish firms, and the reason therefor is, that it delivers its goods free of charges, and also because the goods have an established and enviable reputation. To the trade it makes a discount of 25 per cent. In its retail shop in Barcelona the price-list for boots and shoes is the following, and all of the boots and shoes were manufactured in Boston.

		Pesetas.
Ladies' Cape May	per pair	4.50
Florence	do	4.00
Empress	do	18.00
Woman's foothold	do	3.35
Men's footholds	do	5.25
Dull friction thigh	do	38.00
Storm king	do	33.50
Pebble short light	do	29.00
Men's plain Oxford	do	7.00
Hub Arctics	do	13.00
Women's light buckle Arctic	do	10.50
Whole vamp foothold	do	3.35
Child Broadway springheel	do	2.75
Boy's plain self-acting	per pair	5.00
Men's dull friction hip	do	35.40
Bright wool hip	do	35.75
Woman croquet	do	3.60
Misses' croquet	do	2.80
Woman's imitation self-acting, per pair		4.30
Woman's wool boots	per pair	14.45
Misses' cotton boots	do	11.25
Child's cotton boots	do	9.50
Misses' wool boots	do	12.20
Men's dull friction knee	do	26.20

The garments sold here by the Macintosh Company are made up from cloth imported from Manchester. The prices for overcoats for men range from 31 to 84 pesetas; for cloaks for women, from 36 to 82 pesetas; and for cloaks for children, from 23 to 60 pesetas. The price of the cloth itself ranges from 5 to 16¾ pesetas per meter.

There are no exportations of rubber from Spain except to her colonies.

In view of the foregoing facts and figures and of conversations that I have had with some of the men of this city that are engaged in the rubber business, I am convinced that the importation of fancy goods, shoes, boots, and clothing from the United States can be greatly increased in this district. In the southern districts of Spain, on the other hand, the trade in rubber must always be comparatively small because of the climate, which is such as to render rubber garments and shoes not only almost unnecessary but also almost insufferable. Even in the north of Spain the climate is not as favorable to rubber men as it might be. Still there is sufficient rain during the autumn and winter to make a rubber outfit a valuable acquisition to one's wardrobe. But an exporter to Spain from the United States must necessarily expect sharp competition in all garments and fancy goods. Compared with other foreign exporters he is at a disadvantage in two respects, and those are distance and lack of direct communication with the ports of Spain. But even if he can afford to compete in Spanish markets, he will still find himself at a disadvantage, unless he delivers his goods free of charges, or unless he deals with his agent here directly. Spaniards dislike exchanges, costs, and duties, and will buy inferior goods that bring him no trouble rather than superior goods that cause him vexation; and Spanish agents take far less interest in pushing goods if they are dealt with through agents in London and Paris, and divide with them their commissions. In other words, if the American exporter uses tact and is duly considerate, his goods will be accepted with greater favor and sold with greater favor.

HERBERT W. BOWEN,
Consul.

UNITED STATES CONSULATE,
Barcelona, October 22, 1890.

SWITZERLAND.

BASLE.

REPORT BY CONSUL GIFFORD.

MANUFACTURE.

In this consular district, as well as in Switzerland in general, the manufacture of rubber goods is almost wholly confined to tissues designed for shoe elastics. The extent of this industry is relatively considerable, there being seven factories in operation, all but one of which are situated in this district.

The greater part of the product of these manufactories is exported, as well as that of the seventh factory in Schaffhausen. The approximate value of these goods will be indicated by the following table of exports:

EXPORTS.

Table showing export from Switzerland of all kinds of rubber tissues in combination with wool, cotton, silk, etc., during the year 1889.

To what country exported.	Weight in metric centners.	Value.
France	387	$101,600
Spain	347	88,500
Germany	224	58,200
Austria	165	43,800
Danubian countries	138	31,600
Argentine Republic	94	24,500
Italy	92	21,500
Other countries	428	113,600
Total	1,875	483,300

DUTY.

The crude rubber introduced into Switzerland is subject to a duty of 4 francs (77 cents) per metric quintal (220 pounds).

IMPORTS.

During the year 1889 rubber goods were imported into Switzerland as follows:

Kind of goods.	From what country imported.	Weight in metrics.	Value.
		Quintals.	
India rubber and gutta-percha in hose and pipes	Germany	399	$55,800
	Other countries	62	8,800
Boots, shoes, and other goods of pure rubber and gutta-percha.	Germany	261	47,000
	England	160	28,800
	Other countries	74	13,400
Elastic tissues of all kinds, in composition with cotton, wool, silk, etc.	Germany	77	20,000
	France	28	7,200
	England	22	5,800
	Other countries	10	2,600
Boots and shoes of all kinds in composition with other materials.		65	11,800
Total		1,158	201,200

IMPORTS FROM THE UNITED STATES.

Such rubber goods as reach Switzerland from the United States are for the most part introduced from Germany, and are not separately noted in the official statistics. American firms have established branch houses in Hamburg, whence rubber shoes, belting, hose, and packing material are shipped to Switzerland. The exact amount of these imports is not to be determined from published statistics, the greater part of the same being no doubt embraced in the sum of imports accorded to Germany.

DUTY ON RUBBER MANUFACTURES.

Manufactures of rubber imported into Switzerland are dutiable as follows:

Rubber applied upon tissues or other material, boots, shoes, and other articles not especially mentioned, not in combination with other material, 17 francs per metric quintal.

Elastic tissues of rubber in combination with cotton, wool, silk, etc., 40 francs per metric quintal.

Boots and shoes of rubber in combination with other material, 30 francs per metric quintal.

REPUTATION OF AMERICAN GOODS.

According to the statement of local dealers rubber clothing and shoes are obtained chiefly from England, the quality of these English goods being, it is stated, superior to that of the corresponding American articles. This preference is alleged to exist notwithstanding the fact that the American goods can be sold cheaper than the English. Rubber overshoes manufactured by an American-Russian house in St. Petersburg enjoy a good repute and find ready sale.

POSSIBILITY OF INCREASING AMERICAN BUSINESS.

Dealers in rubber manufactures and other persons acquainted with the subject are of the opinion that the direct importation of American goods, especially overshoes and packing material, might be somewhat increased, though the business is now chiefly in the hands of foreign manufacturers. For the former article it would be indispensable that the quality of the article should be superior. But it should be remarked that the use of overshoes in Switzerland is by no means so common as in the United States, and that the demand for them is accordingly small. Technical and scientific articles would hardly find a ready market here, on account of the inevitable delay in their delivery.

GEORGE GIFFORD,
Consul.

UNITED STATES CONSULATE,
Basle, October 29, 1890.

ST. GALL.

REPORT BY CONSUL ROBERTSON.

IMPORTS OF RUBBER GOODS.

The extent of the importation of manufactures of rubber into this district ranges, as nearly as can be ascertained, from 250,000 to 300,000 francs per annum. The leading country of origin is Germany, with far smaller amounts from France, England, and the United States, in the order named.

Imports into Switzerland in the year 1889.

Quantity.	Value.	From the United States.	
		Quantity.	Value.
Quintals.	*Francs.*	*Quintals.*	*Francs.*
51	40,800	.....	.....
379	492,700	14	18,200
522	365,400	.....	.....
238	208,250	.....	.....
461	322,700	12	10,600
495	445,500		
137	178,100	.....	.....
65	58,500	.....	.....
2,348	2,111,950	26	28,800

There are actually no rubber goods imported directly from the United States into my district, and but a small quantity, as has just been shown, into all Switzerland. In former times, say 20 years, so I am informed, American rubber belting was used here in respectable quantity; but this was supplanted by leather belting, which had become more popular because of its proving stronger, of greater resistance, and less affected by fluctuations of temperature.

Rubber tubing, clothes, boots, shoes, mats, etc., are sold here, but the demand therefor being limited, most dealers of my district are accustomed to order supplies of these articles from or through importers at Basle, Berne, and Zurich.

Mr. G. L. Tobler, of St. Gallen, is, to my knowledge, the only importing house here.

The Swiss rates of duty upon rubber imports are as follows, per 100 kilos:

	General tariff.	Special tariff.	Tariff number.
	Francs.	*Francs.*	
Rubber, pure or mixed, raw, cut, drawn, in heads.....	4	7	348

As far as concerns quality, American rubber goods are considered fully on a level with those of other countries, and would, doubtless, be much more largely used were our factories geographically as near to Switzerland as are those of Germany and France.

The chief obstacles to the introduction of our manufactures of rubber here are the limited consumption of such articles, the length of time necessary to await the fulfillment of an order given, and the higher freight rates, as compared with those of adjacent countries.

From climatic causes, the goods do not keep well when stored, and hence are only ordered in quantities to suit the actual demand at the time.

The ability of Germany, from her position, to quickly deliver these goods, and at very moderate transportation charges, even on small ship-

ments, give her a large advantage at the outset toward securing and retaining the market of Switzerland for her rubber goods.

For reasons above set forth, the only means by which American rubber manufacturers can extend their trade into this district is that of lower prices, or by making goods of such a quality that they would be in the end cheaper than such as cost, perhaps, less to purchase, but which fall far short of giving the same satisfaction.

The encouragement held out is, I think, not great for a larger increase in the consumption of our rubber products.

As direct orders would scarcely be obtainable, trials could only be made by consignments, for which such places as Geneva, Basle, or Zurich would be the most suitable points.

W. HENRY ROBERTSON,
Consul.

UNITED STATES CONSULATE,
St. Gallen, November 1, 1890.

ZURICH.

REPORT BY CONSUL CATLIN.

India rubber enters but little into the manufactures of this consular district. There is one small factory near Zurich employing a few workmen, and devoted to the manufacture of the smaller classes of rubber goods, but none of the more important articles of the trade, such as rubber clothing, boots, shoes, or belting, are made in this vicinity.

The manufacture of elastic webbing is the only branch of the India-rubber business extensively carried on in Switzerland. The exports in this line amounted last year to 2,411,911 francs. The raw material, India-rubber thread, was imported to the amount of 492,700 francs. Of the product resulting therefrom in elastic webbing, a portion went to supply the home consumption, and the remainder, to the amount above stated, was exported elsewhere.

Under the proposed new tariff, now under consideration by the federal authorities at Berne, India rubber, raw and manufactured, figures as follows, viz:

	Francs.
Caoutchouc and gutta-percha, pure or mixed, raw, cut, drawn, in balls, plates, sheets, bands, threads ..... per 100 kilos..	1
Carding cloths ..... do....	4
Caoutchouc and gutta-percha in hose tubes, also in connection with other materials ..... per 100 kilos..	10
Caoutchouc and gutta-percha on tissues or other stuffs, elastic tissues of all kinds made of caoutchouc in connection with cotton, wool, silk, etc., and other goods of caoutchouc and gutta-percha not herein named..per 100 kilos..	40

The following tables, compiled from federal statistics, show the extent of importation and exportation of rubber, raw and manufactured, into

nd from Switzerland during the year 1889, together with the respective ountries of origin and destination, viz:

	Imports.	Exports.
	Francs.	*Francs.*
India rubber, raw:		
Germany	22,400	794
France	15,200	5,510
Belgium	1,600	.....
Austria	800	370
England	800	900
Italy	.....	890
Egypt	.....	30
Total	40,800	8,494
I. India-rubber thread:		
Germany	106,600	116
France	5,200	2,600
Italy	1,300	8
England	361,400	.....
United States	18,200	.....
Turkey	.....	55
Total	492,700	2,779
II. Card cloth:		
England	203,875	.....
Germany	4,375	2,000
Austria	.....	25
Total	208,250	2,025
V. India-rubber sheets, belting, valves, etc.:		
Germany	273,700	9,211
England	46,900	515
France	36,400	679
Austria	700	1,102
Italy	4,200	6,651
Belgium	2,800	200
Holland	700	60
Elsewhere	.....	45
Total	365,400	18,463
V. India-rubber hose:		
Germany	279,300	4,503
England	8,400	720
France	28,000	301
Austria	700	909
Italy	5,600	3,929
United States	700	255
Total	322,700	10,617
VI. India-rubber textiles, surgical and household articles, shoes, unsewed:		
Germany	234,900	1,854
England	144,000	390
France	38,700	2,757
United States	9,900	.....
Austria	4,500	434
Italy	4,500	2,759
Belgium	2,700	.....
VI. India-rubber textiles, etc.—Continued.		
Holland	6,300	200
Elsewhere	.....	815
Total	445,500	9,209
VII. India-rubber shoes, sewed:		
Germany	19,800	812
England	28,800	.....
France	9,000	104
Austria	900	100
Italy	.....	60
Total	58,500	1,076
VIII. Elastic webs of all sorts (chiefly for shoes):		
Germany	100,100	291,513
Austria	6,500	218,580
France	36,400	503,092
Italy	5,200	107,201
Belgium	1,300	81,972
Holland	.....	584
England	28,600	48,460
Sweden	.....	3,280
Denmark	.....	1,975
Portugal	.....	12,788
Spain	.....	443,313
Greece	.....	1,810
Danube countries	.....	157,684
Turkey in Europe	.....	43,610
Egypt	.....	36,175
Algiers	.....	8,861
Turkey in Asia	.....	70,144
British India	.....	3,600
Dutch India	.....	3,140
Eastern Asia	.....	15,510
United States	.....	67,606
Central America	.....	48,590
Chile	.....	10,420
Brazil	.....	102,830
Argentine Republic	.....	122,070
Other South American States	.....	7,103
Total	178,100	2,411,911
IX. India-rubber clothing:		
Germany	94,000	2,137
England	66,000	4,023
France	54,000	1,841
Austria	8,000	38
Italy	2,000	95
Holland	10,000	.....
Elsewhere	.....	75
Total	234,000	8,209

It will be observed that in the foregoing tables the United States do not figure conspicuously, appearing, in fact, in but three of the nine categories, and there only for comparatively small amounts, viz:

India rubber—	Francs.	Per cent.
Thread	18,200	3.73
Shoes	9,900	2
Hose	700	0.2

A prominent rubber dealer in this city, to whom I am indebted for many valuable suggestions in the preparation of this report, writes as follows:

It is in the nature of the business that, with the exception of rubber thread and rubber shoes and perhaps some specialties in technical goods, such as hose and belting, the United States stand little chance of competing successfully in the Swiss market, inasmuch as there is a great production in England, Germany, and France, and the manufacturers in those countries have an advantage over the Americans in being able to supply goods quickly, which, as all engaged in the rubber trade will understand, is of primary importance in rubber goods intended for technical, industrial, and surgical purposes, as well as in the rubber clothing and piece goods. The import of rubber thread and rubber shoes from the United States, as mentioned above, though small, is nevertheless a beginning. Its extension depends to a great degree on the American manufacturers themselves. It must, however, by no means be looked upon as an easy matter. Rubber manufacturers in the United States contemplating the establishment or extension of an export business must reconcile themselves to the conviction that export relations with an old market can not be acquired in a hurry, but that the field requires planting and care before regular harvests of any importance can be reaped.

As regards the merits of American rubber goods in comparison with those from other countries, the same dealer observes:

As far as rubber thread is concerned, quality and price are what tell. As regards rubber shoes, however, shape, style, and finish are also of equal importance, and American manufacturers, desiring to build up a successful export trade in this line, must consent to adapt their goods, when intended for European sale, to the requirements of the European markets.

The North British Rubber Shoe Company, of Edinburgh; the Compagnie Nationale de Caoutchouc, of Paris; and the Russian-American Company, of St. Petersburg, justly enjoy a very high reputation as to the quality, shape, and finish of their rubber shoes, and it will consequently require great efforts on the part of American manufacturers to compete successfully with them in this market. It can only be done by engaging experienced firms established on the spot as informants and buyers, and by following their advice. It will not do to look upon the export business merely as a periodical offset for eventual slack times at home; on the contrary, export orders should always receive the first attention because of the longer time required for correspondence and delivering. Delays or failures in the supply, or irregularity in the shapes once adopted, would at once put a stop to the business. Energetic and patient American manufacturers may, however, by following the foregoing suggestions, build up a trade in Switzerland, of which Zurich is the commercial center, and would in time find it a valuable item in their export relations.

These remarks, coming as they do from an experienced rubber dealer of long standing in this community, can not but prove of value to American manufacturers desiring to open direct trade with Switzerland. I would especially dwell upon the importance of three of the points referred to, viz, first, the prompt delivery of goods; second, the adapting of shipments, as regards shape and style and finish, to the wants of this market; and third, the necessity of not merely regarding the export business as a safely valve for dull times in the home market. How ready our domestic manufacturers are to throw over the foreign orders when business is "booming" at home, is evidenced by a letter from a large rubber shoe factory to the Zurich dealer in question, dated

"Boston, October 15, 1890," saying that "owing to the demand for goods in this country exceeding the supply," it will probably be another season before they can seriously go in for export. The same dealer further informs me that an order for shoes which he sent to Boston in May last was not delivered until this month (October), this and then, with 20 per cent. addition on account of the alterations made to suit the Swiss market. On the other hand, similar orders, when sent to the companies above named at St. Petersburg, Paris, and Edinburgh, are promptly filled with saleable goods at fixed prices. American manufacturers must bear this fact in mind, if they expect to compete.

In conclusion, I append herewith a list of the dealers in rubber goods in this city:

H. Specker, 90 Bahnhofstrasse, Zurich.
J. E. Naef, 10 Marktgasse, Zurich.
L. W. Custer, 83 Bahnhofstrasse, Zurich.
Keyser-Pauly, 8 Thalgasse, Zurich.
E. Naef, 10 Baerengasse, Zurich.
L. Wollstadt, 69 Bahnhofstrasse, Zurich.
Gust. Wunderli, 4 Limmatquai, Zurich.
L. Wachendorf, 4 Werdstrasse, Aussersihl.

Price lists from two of the above-mentioned firms also accompany this report.

GEORGE L. CATLIN,
Consul.

UNITED STATES CONSULATE,
Zurich, October 29, 1890.

TURKEY.

REPORT BY CONSUL-GENERAL SWEENEY, OF CONSTANTINOPLE.

The principal articles imported are the rubber overshoes and waterproof garments. About 7,500 boxes or cases, each containing an assortment of 50 pairs, are sold annually here from the month of September to April. As regards quality those of the North British India Rubber Company, of Edinburgh, England, and the Russian-American India Rubber Company, of St. Petersburg, Russia, are considered here the best. There has been an attempt by some dealers to sell American rubber overshoes here, and they imported a small quantity, but I am informed that they could not carry on the trade satisfactorily.

The trade is generally carried on for the account of the different European manufacturers, who keep stocks here during the winter season. The agents keep up the prices according to the quality of their goods, and sell to all the wholesale houses of this capital, and to provincial customers. The overshoes must be made out of thick material and in fashionable shape, with red lining, these being the requirements of this market, and should be here before the month of October. The approxi-

	Cases.		
North British India Rubber Co	1,500 to 2,000	$36.30	
Russian-American India Rubber Co	350 to 500	36.30	
Liverpool India Rubber Co	1,200 to 1,500	32.47	
Hamburg India Rubber Co	1,200 to 1,500	26.37	
Hutchinson, Paris	1,500 to 2,000	26.37	

The goods are delivered in Constantinople at the above prices, fr agents' stores, free of freight, insurance, sundry charges, and custo which amount together to about 12 per cent ad valorem.

WATERPROOF GARMENTS.

The quantity of coats imported in different shapes, and chiefly f gentlemen and boys, annually for the wants of the capital and that the provinces is calculated to about 12,000 to 15,000 pieces. The large portion comes from Manchester, England. Glasgow; London, England Paris, France; Hamburg, Germany; and Vienna, Austria, send the mos fashionable of these waterproof coats. The selling prices here run fro $1.93 to 10.89 per piece on the same conditions as for overshoes.

As regards other India-rubber articles, there is no industry existin in this country. There is only a small importation of sheet valves, pipe and tubes for machinery, and some other goods for chirurgical and me ical use. The value of all these goods is $75,155.69 per annum, accor ing to the last statement of the custom-house authorities.

The best method for introducing American rubber goods in this ma ket is for American manufacturers first to decide to follow the prices the competition, and then intrust their business into the hands of a clev agent, who by means of timely advertisments and a good exhibition their goods would be able to make a way for them. In addition to t the American manufacturers must bear in mind that special shapes a making up of the overshoes will be required according to the wants the customers, and that all garments must be of double texture, p vided with hoods, and made much wider than those used in Engla France, or Germany, as the people of this country are rather stout, ha large shoulders, and wear the waterproofs over thick winter overco

I beg to thank E. J. Merstrauff, a well-known merchant of this ci dealing largely in rubber goods, for the greater portion of the informa tion contained in this report. Mr. Merstrauff will be glad to assis

American rubber manufacturers in the work of introducing their wares into this market.

Z. T. SWEENEY,
Consul-General.

UNITED STATES CONSULATE-GENERAL,
Constantinople, December 29, 1890.

THE UNITED KINGDOM.

REPORT BY CONSUL GRINNELL, OF MANCHESTER.

It has at all times been a difficult matter to obtain from English manufacturers and merchants information relative to the trades in which they are engaged, and now, owing to the recent passage of the new tariff, the difficulty is greatly increased, and any attempt by an American to procure facts or figures which would be of use or interest to manufacturers in the United States is practically a vain one.

I have, in accordance with instructions, endeavored to obtain some information as to the manufactures of India rubber in the consular district of Manchester. To this end I addressed sixteen letters of inquiry to the principal manufacturers and dealers in rubber goods in this district. I have received but five replies, two of which were refusals to give any information whatsoever, and one only of the remaining three touched the questions contained in my letter.

The manufactures of rubber produced in this district consist mainly of sheets used in the manufacture of card clothing, air-proof goods, balls, bed and hospital sheeting, belting, bicycle rubbers, mats, cart covers, dress preservers, elastic bands, waterproof garments, hose, rugs, sheeting, surgical goods, and tubing and tires for all purposes.

Rubber coats and shoes are not manufactured in this district, and in this connection Messrs. J. Mandleberg & Co., Limited (one of the largest manufacturers of India-rubber piece goods, waterproof garments, etc., in Manchester), in their reply to my inquiries say:

> Our experience of American rubber goods extends only to shoes, which we consider compare favorably with those from other countries.

Messrs. J. Mandleberg & Co., Limited, furnished me with a copy of two of their price lists, and here I would observe that this firm merit the thanks of the Department, as being the only firm which gave and showed willingness to give information as to their manufactures.

Statistics as to the extent and value of the importation of manufactures of rubber into this district are not obtainable. I am enabled, however, through the courtesy of Mr. Herbert Standring, publisher of the India Rubber and Gutta-percha and Electrical Trades Journal, to give below the value and quantity, with the countries of origin, of manufactures of rubber imported into the United Kingdom for the last four years.

Imports into the United Kingdom.

From—	1886.		1887.		1888.		1889.	
	Quantity.	Value.	Quantity.	Value.	Quantity.	Value.	Quantity.	Value
	Pounds.		*Pounds.*		*Pounds.*		*Pounds.*	
Germany	1,611,751	$191,142	1,688,200	161,443	2,055,955	164,166	1,943,997	165,
Holland	343,715	52,155	191,629	28,589	207,720	28,356	182,246	27,
Belgium	258,965	43,580	334,062	56,691	86,643	13,220	86,416	15,
France	267,695	38,620	394,269	48,138	366,658	42,362	482,767	58,
United States	185,488	27,181	204,542	25,479	374,410	40,990	416,388	50,
Other countries	11,150	804	2,188	82	15,796	764	20,062	1,
British Possessions	2,446	247	1,763	67	9,328	717	1,100	
Total	2,681,210	353,729	2,816,653	317,489	3,116,510	290,573	3,132,976	318,

I am also indebted to Mr. Standring for a copy of a "Statistical statement from the official returns of the India rubber, caoutchouc, and gutta-percha trade of the United Kingdom during the last decade," which I inclose.

During the four quarters of the year ending September 30, 1890, the invoiced value of waterproof garments shipped from this consular district to the United States was as follows:

Quarters ending—	Amount
December 31, 1889	$19,050
March 31, 1890	7,552
June 30, 1890	5,634
September 30, 1890	17,027
Total	49,264

I inclose, extracted from the columns of the India Rubber and Gutta-percha Journal, interesting statistical tables relating to the importation and exportation of caoutchouc, India rubber, and manufactures thereof.

WILLIAM F. GRINNELL,
Consul.

UNITED STATES CONSULATE,
Manchester, November 20, 1890.

Month.	Quantity (in cwts.).	Value declared by the trade to customs.	Average price per cwt. (in shillings)	Quantity (in cwts.).	Value declared by the trade to customs.	Average price per cwt. (in shillings)	Quantity (in cwts.).	Value declared by the trade to customs.	Average price per cwt. (in shillings)	Quantity (in cwts.).	Value declared by the trade to customs.	Average price per cwt. (in shillings)
	1883.			1884.			1885.			1886.		
January	20,269	£338,279	333	14,796	£247,653	334	19,355	£227,372	234	18,418	£212,331	230
February	21,043	375,204	356	24,933	364,956	292	28,730	354,205	246	19,131	237,353	248
March	17,371	292,293	336	28,133	392,148	278	18,221	186,762	205	16,802	175,130	208
April	21,294	380,140	357	21,630	262,351	242	12,050	130,889	217	15,709	181,271	230
May	20,405	359,700	352	12,326	119,207	193	12,934	140,315	217	12,615	124,565	197
June	18,791	283,887	302	14,004	123,484	176	10,650	99,554	187	11,041	105,322	190
July	14,421	197,196	273	14,161	112,037	158	7,994	88,988	222	11,284	111,639	197
August	20,199	291,698	288	10,448	92,313	176	11,654	126,017	216	12,014	115,846	192
September	15,178	229,074	301	14,657	135,623	185	11,503	117,758	204	17,049	196,409	234
October	19,955	285,284	285	11,528	110,483	191	11,055	109,956	198	13,351	159,721	239
Ten months	188,926	3,032,755	*321	166,616	1,960,255	*235	144,146	1,581,816	*219	147,414	1,617,587	*219
November	20,942	319,500	305	14,091	141,124	200	15,330	167,667	218	22,974	302,320	263
December	17,554	266,021	303	17,294	165,491	191	20,227	226,175	223	22,130	280,839	253
Twelve months†	229,101	3,652,817	*318	198,844	2,272,499	*228	180,141	1,981,735	*220	192,518	2,202,746	*228
	1887.			1888.			1889.			1890.		
January	30,860	£422,036	273	21,145	£277,057	262	22,507	£273,580	243	22,104	£274,241	248
February	20,520	268,749	261	28,242	380,316	269	37,734	480,400	254	22,978	304,525	265
March	30,787	246,036	160	14,620	180,676	247	24,317	299,194	246	27,720	338,016	243
April	19,327	245,946	254	19,112	199,213	208	15,264	145,595	191	20,817	251,404	241
May	15,531	170,208	219	14,116	146,257	207	15,871	154,526	194	18,338	214,742	234
June	14,811	165,820	223	12,473	131,142	210	9,876	99,266	201	14,529	166,846	230
July	13,285	141,062	212	12,119	117,363	194	14,171	131,883	186	16,368	159,219	194
August	18,064	200,519	222	15,656	151,685	194	13,207	125,996	191	12,296	135,130	209
September	17,114	184,430	215	19,080	223,065	234	22,500	239,263	213	24,767	358,291	289
October	18,410	198,416	215	16,399	169,822	207	19,615	213,530	218	23,676	302,421	255
Ten months	198,707	2,243,222	*226	172,962	1,976,596	*228	195,062	2,163,233	*222	203,593	2,504,835	*246
November	17,236	199,893	232	21,736	268,374	247	17,409	188,724	216	.....	.....	.....
December	19,594	239,340	244	23,473	284,466	242	23,803	260,747	219	.....	.....	.....
Twelve months†	325,539	2,682,545	*228	218,171	2,529,436	*232	236,310	2,617,369	*221	.....	.....	.....

* Average.

† Revised figures.

Exports of caoutchouc (raw) from the United Kingdom for each month from January, 1883, to October, 1890.

Month.	Quantity (in cwts.).	Value declared by the trade to customs.	Average price per cwt. (in shillings)	Quantity (in cwts.).	Value declared by the trade to customs.	Average price per cwt. (in shillings)	Quantity (in cwts.).	Value declared by the trade to customs.	Average price per cwt. (in shillings)	Quantity (in cwts.).	Value declared by the trade to customs.	Average price per cwt. (in shillings)
	1883.			1884.			1885.			1886.		
January	7,785	£116,213	298	6,969	£87,377	250	10,966	£117,607	214	6,146	£63,500	206
February	4,351	61,448	282	10,573	144,231	272	9,418	101,784	216	6,805	70,266	206
March	4,322	58,373	270	6,448	81,966	254	7,222	75,049	207	9,355	97,622	208
April	8,301	118,914	286	9,474	116,531	246	6,551	65,468	199	9,848	118,685	241
May	13,078	206,025	315	8,458	89,673	212	6,460	63,641	197	17,216	231,408	268
June	6,663	101,725	305	6,121	64,339	210	6,967	79,536	228	11,728	151,951	259
July	5,248	75,107	274	5,831	54,655	187	5,301	43,110	162	8,074	94,725	234
August	6,703	85,376	254	11,814	103,442	175	5,275	53,152	201	6,093	62,741	205
September	9,391	143,286	305	14,384	125,261	174	8,742	82,769	189	8,416	92,726	220
October	11,402	168,896	296	10,410	96,846	186	5,878	58,135	197	8,854	96,679	218
Ten months	77,244	1,135,363	*294	90,482	966,321	*213	72,780	740,251	*203	92,535	1,080,303	*233
November	11,518	156,530	271	8,589	85,831	199	10,003	79,648	159	7,953	91,139	229
December	13,748	174,438	253	10,785	105,337	195	9,489	99,056	208	8,928	110,057	246
Twelve months†	102,570	1,463,350	*285	109,856	1,155,487	*210	89,810	963,515	*214	111,437	1,303,880	*234
	1887.			1888.			1889.			1890.		
January	12,126	139,309	229	9,799	113,249	231	11,740	131,184	223	10,645	112,655	211
February	12,312	129,840	211	7,251	73,458	202	7,163	77,227	215	11,283	114,880	204
March	11,260	139,668	248	10,427	89,840	172	7,869	85,699	218	16,882	181,445	215
April	9,581	125,474	262	14,734	162,644	220	13,685	154,360	225	12,314	147,359	239
May	11,712	116,430	198	11,271	122,847	218	16,343	176,687	216	18,830	252,634	268
June	10,566	130,933	247	11,368	141,452	249	8,115	83,011	204	10,103	117,330	232
July	5,655	72,339	255	9,313	94,309	202	6,687	69,819	208	9,277	126,960	272
August	4,851	55,367	228	9,473	82,758	175	8,750	82,398	188	9,489	134,383	283
September	8,598	97,617	227	9,310	93,331	200	11,811	133,979	227	12,090	145,568	240
October	11,277	121,579	215	11,984	129,826	216	14,611	155,005	212	9,589	122,561	255
Ten months	97,938	1,128,556	*230	104,930	1,103,714	*210	106,774	1,149,369	*215	120,502	1,455,774	*241
November	12,945	131,648	203	14,291	135,508	190	10,973	123,707	225	.....	.....	.....
December	5,687	81,439	286	8,593	96,613	224	11,295	121,171	214	.....	.....	.....
Twelve months†	116,570	1,341,643	*232	127,814	1,335,835	*209	130,506	1,411,554	*216	.....	.....	.....

* Average.

† Revised figures.

Imports of gutta percha (raw) into the United Kingdom for each month from January, 1880, to October, [illegible]

Month.	Quantity (in cwts.).	Value declared by the trade to customs.	Average price per cwt. (in shillings)	Quantity (in cwts.).	Value declared by the trade to customs.	Average price per cwt. (in shillings)	Quantity (in cwts.).	Value declared by the trade to customs.	Average price per cwt. (in shillings)	Quantity (in cwts.).	Value declared by the trade to customs.	Average price per cwt. (in shillings)
	1883.			1884.			1885.			1886.		
January	672	£6,020	179	4,523	£37,057	163	7,540	£48,025	127	3,523	£23,327	132
February	9,756	74,078	151	9,508	78,503	165	3,110	21,249	136	6,311	37,213	118
March	4,907	37,136	148	3,879	20,133	103	6,184	43,970	142	3,337	16,795	100
April	5,477	40,043	146	7,662	54,286	141	2,363	14,584	123	2,533	19,252	152
May	2,129	18,875	177	6,801	55,211	162	3,575	24,282	135	3,988	26,023	130
June	7,063	46,183	130	5,699	43,255	151	3,454	22,305	129	784	4,296	109
July	2,308	19,672	170	5,534	44,626	161	2,833	18,286	129	2,399	13,619	113
August	4,084	33,932	166	4,551	30,518	134	6,991	42,944	122	4,465	39,477	177
September	5,530	35,569	128	4,401	31,466	143	3,197	18,236	114	4,951	33,935	137
October	5,590	35,672	127	2,437	22,493	184	7,232	47,736	132	1,169	7,151	122
Ten months	47,606	347,180	*145	54,995	417,648	*152	46,479	301,707	*130	33,460	221,088	*132
November	3,670	34,749	189	3,145	22,824	145	2,238	17,038	152	4,331	29,463	136
December	11,797	86,459	146	4,573	22,374	97	5,177	29,359	113	2,906	19,257	132
Twelve months †	63,800	476,881	*150	62,713	462,746	*147	53,839	347,133	*129	40,697	269,808	*132
	1887.			1888.			1889.			1890.		
January	1,474	£6,471	88	1,725	£13,974	162	2,399	£23,370	195	5,158	£55,038	213
February	671	2,566	76	928	5,268	113	1,813	20,918	231	7,216	88,841	246
March	2,448	16,290	133	1,690	13,252	157	3,119	29,113	186	5,240	70,753	270
April	3,649	16,336	90	1,199	7,807	130	4,133	46,185	223	8,204	100,588	245
May	2,782	22,270	160	3,199	25,462	159	3,457	43,456	251	6,505	65,543	201
June	2,177	14,623	134	2,552	20,812	163	2,928	27,580	189	3,134	26,909	171
July	1,485	9,382	126	1,015	7,623	150	3,773	47,531	251	4,051	43,657	215
August	1,324	6,323	96	2,964	29,913	202	7,201	106,173	294	4,736	55,709	235
September	2,047	16,424	160	2,727	21,696	159	4,702	42,506	181	7,075	79,708	225
October	1,841	13,741	148	1,811	15,571	172	5,417	82,128	303	9,175	99,267	216
Ten months	19,898	124,426	*125	19,810	161,378	*163	38,942	468,960	*241	60,494	686,013	*226
November	1,403	9,557	136	1,565	14,024	179	2,320	21,652	186	.....	.....	.....
December	2,844	22,580	158	1,108	6,258	112	6,780	86,284	254	.....	.....	.....
Twelve months †	24,145	156,563	*129	22,483	181,660	*162	47,832	575,029	*220	.....	.....	.....

* Average.

† Revised figures.

Exports of gutta-percha (raw) from the United Kingdom for each month from January, 1883, to October, 1890.

Month.	Quantity (in cwts.).	Value declared by the trade to customs.	Average price per cwt. (in shillings)	Quantity (in cwts.).	Value declared by the trade to customs.	Average price per cwt. (in shillings)	Quantity (in cwts.).	Value declared by the trade to customs.	Average price per cwt. (in shillings)	Quantity (in cwts.).	Value declared by the trade to customs.	Average price per cwt. (in shillings)
	1883.			1884.			1885.			1886.		
January	915	£7,811	170	239	£1,618	135	1,423	£11,522	162	454	£2,387	105
February	1,009	8,105	160	331	1,959	118	1,157	7,771	134	661	3,565	108
March	599	5,258	175	529	3,972	150	614	4,577	149	1,025	5,065	98
April	1,587	15,213	101	564	5,423	192	857	7,357	171	1,929	12,018	124
May	886	7,826	176	1,144	12,595	220	939	6,014	128	356	3,118	175
June	734	7,786	212	578	4,735	163	147	1,264	171	935	4,862	104
July	767	7,548	196	1,126	6,982	124	853	5,663	132	1,551	11,370	146
August	1,148	9,286	161	940	6,021	128	850	4,820	113	493	4,626	187
September	474	3,674	155	793	4,699	118	603	3,350	111	1,139	5,365	94
October	568	4,371	153	581	3,702	129	389	3,774	194	893	8,871	198
Ten months	8,687	76,878	*177	6,825	51,776	*152	7,832	56,112	*143	9,436	61,247	*130
November	397	2,488	125	225	1,943	172	1,121	8,621	153	1,166	7,668	131
December	778	4,653	119	637	2,984	93	713	5,923	166	923	6,544	141
Twelve months †	9,862	84,019	*170	7,687	56,693	*147	9,666	70,656	*146	11,525	75,459	*130
	1887.			1888.			1889.			1890.		
January	1,296	9,675	146	791	3,599	91	721	6,423	178	456	4,265	137
February	979	9,082	185	347	3,258	188	380	4,204	221	1,130	12,416	219
March	1,213	5,558	91	1,069	6,417	120	715	5,135	143	1,082	3,177	58
April	180	873	97	401	2,464	122	797	6,917	173	1,863	12,035	176
May	381	1,898	99	636	4,543	142	873	4,847	111	986	12,416	252
June	389	2,098	108	616	5,446	164	401	3,041	151	504	5,809	230
July	1,317	9,500	144	967	5,957	123	616	4,546	147	762	10,042	263
August	608	3,470	113	601	9,560	302	333	3,324	200	576	7,630	265
September	773	6,310	163	500	3,246	129	695	7,605	219	1,028	7,434	144
October	750	5,100	136	787	6,775	172	763	9,696	254	1,615	14,358	179
Ten months	7,886	53,564	*136	6,760	51,265	*151	6,294	55,738	*177	9,502	89,582	188
November	421	3,050	145	761	5,917	155	587	6,126	209	.....	.....	.....
December	517	5,102	197	851	5,190	122	1,371	13,053	190	.....	.....	.....
Twelve months †	8,824	61,716	*139	8,372	62,372	*149	8,304	75,386	*181	.....	.....	.....

*Average. †Revised figures.

Imports of caoutchouc (raw) into the United Kingdom from 1885 to 1889, showing countries of origin.

Country.	1885.			1886.			1887.			1888.			1889.		
	Quantity (in cwts.).	Value declared by the trade to customs.	Average price per cwt. (in shillings).	Quantity (in cwts.).	Value declared by the trade to customs.	Average price per cwt. (in shillings).	Quantity (in cwts.).	Value declared by the trade to customs.	Average price per cwt. (in shillings).	Quantity (in cwts.).	Value declared by the trade to customs.	Average price per cwt. (in shillings).	Quantity (in cwts.).	Value declared by the trade to customs.	Average price per cwt. (in shillings).
Aden	3,595	£30,917	172	4,984	£47,545	190	6,355	£63,024	200	4,646	£41,108	177	4,425	£39,574	179
Africa, East:															
Portuguese	797	7,600	190	1,369	13,242	193	2,694	26,202	194	2,791	26,400	189	2,864	26,728	187
Native	4,337	30,756	141	3,157	26,265	166	2,208	20,605	186	2,149	18,713	174	1,098	9,396	171
Africa, South (British)	1,027	9,060	176	2,317	19,769	170	3,753	31,209	180	2,412	21,375	177	495	3,681	150
Africa, West:															
British	11,615	97,855	168	21,892	175,766	160	26,999	224,875	166	19,611	154,662	158	13,545	105,426	155
Portuguese	2,559	24,465	191	4,844	51,844	214	5,324	54,678	205	2,898	24,283	167	1,951	15,876	162
Other parts	15,830	143,297	181	18,969	171,485	180	17,951	147,552	164	20,934	142,455	135	24,714	167,751	136
America, Central	2,121	20,401	192	498	5,714	230	1,107	13,219	239	521	6,067	233	205	2,247	219
America, United States of	3,895	26,425	135	7,222	25,901	72	7,443	31,337	84	8,914	73,421	164	9,927	50,812	102
Belgium							560	6,032	215	673	7,586	225	1,257	10,775	171
Brazil	97,234	1,255,978	258	90,948	1,330,854	292	113,955	1,605,115	281	106,617	1,604,108	300	122,649	1,779,718	286
China							170	1,429	168						
Colombia, United States of	430	3,946	183	529	5,045	190	1,250	14,823	237	1,581	19,415	245	879	11,518	262
Ecuador	39	390	200							250	2,987	239	295	3,982	270
France	3,813	28,302	148	4,450	26,321	118	5,155	46,635	180	3,803	29,222	153	6,674	34,073	102
Germany	1,527	11,916	156	1,434	9,995	139	2,655	11,784	90	3,464	22,225	128	7,422	49,646	134
Holland	2,138	21,269	199	1,413	10,073	142	2,118	16,949	160	1,313	14,213	156	2,568	20,246	152
Java							182	1,992	219						
Gold Coast and Lagos													5,760	40,906	142
India, British:															
Bombay and Scinde	6,122	54,974	179	11,936	111,224	186	11,668	109,725	188	21,989	196,884	179	14,998	125,095	167
Bengal and Burmah	6,151	57,930	188	5,642	52,649	185	6,422	73,375	228						
Madagascar	41	361	176				1,466	14,860	202	1,942	21,399	220	3,709	36,730	198
British West Indies							478	4,704	197	139	1,154	166			
Mauritius	1,098	11,403	209	658	6,971	212	412	4,834	234	560	6,139	219			
Portugal	7,238	75,010	207	5,588	74,717	267	7,109	96,093	270	11,276	117,432	208	9,176	97,449	212
Straits Settlements	7,662	61,080	160	6,050	47,185	156	9,503	79,287	167						
Uruguay	295	3,852	261	262	3,738	285	113	1,665	296	93	1,456	313			
Other countries	577	4,488	155	586	4,843	165	461	2,562	111	1,269	2,637	41	1,699	9,740	114
Total	180,141	1,981,735	220	194,748	2,222,156	228	237,511	2,704,655	227	220,350	2,555,341	231	236,310	2,617,369	221

Exports of caoutchouc (raw) from the United Kingdom from 1885 to 1889, showing receiving countries.

Country.	1885.			1886.			1887.			1888.			1889.		
	Quantity (in cwts.).	Value declared by the trade to customs.	Average price per cwt. (in shillings).	Quantity (in cwts.).	Value declared by the trade to customs.	Average price per cwt. (in shillings).	Quantity (in cwts.).	Value declared by the trade to customs.	Average price per cwt. (in shillings).	Quantity (in cwts.).	Value declared by the trade to customs.	Average price per cwt. (in shillings).	Quantity (in cwts.).	Value declared by the trade to customs.	Average price per cwt. (in shillings).
America, United States of	25,164	£221,334	175	51,766	£607,270	234	44,824	£467,063	208	49,979	£455,333	182	46,617	£472,778	203
Belgium	2,035	19,475	191	1,125	12,774	227	1,174	14,671	250	1,942	13,950	143	1,858	15,113	162
British Possessions	449	4,608	205	200	1,528	152	54	445	165	320	4,198	.....	420	6,055	290
France	6,760	112,058	331	10,605	102,994	194	9,842	98,755	201	9,565	90,962	190	11,420	116,418	204
Germany	26,740	276,218	206	26,799	303,912	227	35,129	413,481	235	38,149	394,916	207	39,004	398,501	204
Holland	7,811	83,283	213	5,799	69,974	241	6,257	81,608	261	7,064	89,635	253	8,870	102,743	231
Italy	1,715	20,317	236	1,011	15,196	300	2,101	28,288	269	2,807	41,730	297	4,291	59,307	276
Russia	18,847	223,030	236	13,848	187,001	270	16,895	233,101	276	16,489	241,661	293	17,689	235,951	267
Other countries	289	3,191	220	284	3,231	227	296	4,172	282	272	3,443	253	337	4,688	280
Total	89,810	963,514	214	111,437	1,303,880	234	116,572	1,341,584	230	126,587	1,335,828	211	130,506	1,411,554	216

Via port—		1885.	1886.	1887.	1888.	1889.
Dover	cwts.	.....	6	1	4	.....
Folkestone	do.	991	1,014	1,092	1,469	1,495
Glasgow	do.	2	311	531	206	652
Harwich	do.	852	57	320	948	625
Hull	do.	13,543	12,104	13,395	14,504	14,233
Liverpool	do.	44,332	66,848	74,047	75,026	87,197
London	do.	27,021	27,190	25,851	32,402	24,209
New Haven	do.	2,150	3,900	1,295	1,984	1,988
Southampton	do.	859	7	40	43	44
Other ports	do.	.....	.....	.....	1	63
		89,810	111,437	116,572	126,587	130,506

Imports of gutta-percha (raw) into the United Kingdom from 1885 to 1889, showing countries of origin.

Country.	1885.			1886.			1887.			1888.			1889.		
	Quantity (in cwts.).	Value declared by the trade to customs.	Average price per cwt. (in shillings).	Quantity (in cwts.).	Value declared by the trade to customs.	Average price per cwt. (in shillings).	Quantity (in cwts.).	Value declared by the trade to customs.	Average price per cwt. (in shillings).	Quantity (in cwts.).	Value declared by the trade to customs.	Average price per cwt. (in shillings).	Quantity (in cwts.).	Value declared by the trade to customs.	Average price per cwt. (in shillings).
British East Indies	24	£162	135	.....	.....	.....	.....	.....	.....	2	£18	180	41,554	£485,966	234
British Guiana	1,149	9,100	158	961	£6,526	136	1,109	£8,781	158	2,078	23,053	221	3,085	56,092	363
China	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
France	.....	.....	.....	724	5,849	161	393	3,911	200	188	1,538	163	1,005	13,831	275
Germany	.....	.....	.....	1,077	6,101	113	.....	.....	.....	181	1,528	168	687	6,075	177
Holland	1,631	12,706	155	895	6,062	135	216	714	66	633	2,529	80	1,496	12,984	174
Straits Settlements	50,810	323,518	127	36,936	244,617	132	22,343	142,436	127	19,128	151,804	158	.....	.....	.....
Other countries	225	1,647	146	104	653	125	72	658	183	273	1,090	79	5	51	204
Total	53,839	347,133	*129	40,697	269,808	*132	24,133	156,500	*129	22,483	181,560	*161	47,832	575,029	*240
Stock in London (reported by Smith & Son)	50,640	.....	.....	50,800	.....	.....	45,400	.....	.....	.....	.....	.....	.....	.....	.....
Imports to London	48,180	.....	.....	31,520	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....

*Average.

Exports of gutta-percha (raw) from the United Kingdom from 1825 to 1889, showing receiving countries.

America, United States of	664	£7,437	224	1,016	£9,551	188	794	£6,800	170	1,060	£8,758	105	746	£7,647	205
British Possessions	1	8	160	80	225	56	.....	.....	.....	1,425	7,159	100	663	2,175	66
France	1,689	9,663	114	2,817	25,369	180	2,473	21,901	177	978	5,550	113	2,510	21,419	171
Germany	3,940	28,606	145	3,466	19,922	115	4,070	23,843	117	3,801	32,339	170	3,386	34,755	205
Holland	3,106	23,085	148	3,571	14,480	81	.....	.....	.....	.....	.....	.....	.....	.....	.....
Other countries	266	1,797	135	573	5,933	205	1,487	9,172	123	1,109	8,584	154	999	9,390	188
Total	7,687	56,093	147	9,666	70,656	146	8,824	61,711	139	8,373	62,390	149	8,304	75,386	181

Exports of caoutchouc (manufactured) from the United Kingdom (in pounds sterling) from 1885 to 1889, showing receiving countries.

To—	1885.	1886.	1887.	1888.	1889.
France	£156,041	£172,783	£214,917	£214,688	£201,632
Germany	124,582	156,673	184,410	207,529	179,857
Belgium	127,975	127,078	132,348	144,596	121,231
Holland	61,690	61,450	67,362	76,751	76,124
United States of America	52,068	57,581	46,885	44,469	56,284
Victoria	36,031	34,823	34,055	48,731	47,684
British East Indies	41,112	36,304	47,902	56,003	45,934
Argentine Republic	14,340	18,501	18,955	24,185	37,215
New South Wales	32,747	29,130	32,603	37,455	36,334
Brazil	27,036	30,287	28,401	32,781	36,285
Sweden and Norway	19,209	18,776	19,910	24,512	32,580
Mexico	24,782	27,608	27,414	30,543	25,453
British North America	21,356	24,612	19,362	25,021	21,549
Spain and Canaries	16,430	16,420	18,140	17,202	17,022
Russia	15,867	15,077	23,561	11,997	16,298
Italy	14,085	12,535	13,253	10,943	15,803
New Zealand	14,518	13,034	14,160	13,516	15,430
South Africa	3,449	3,945	6,693	10,159	14,961
Turkey	15,861	20,016	13,320	11,556	14,960
Chile	7,734	7,257	8,979	7,712	13,542
Denmark	11,966	9,546	9,744	12,341	12,232
Japan	8,803	5,737	13,752	7,217	11,997
Queensland *	(*)	(*)	(*)	7,126	7,382
Australian Colony not named *	(*)	10,047	12,291	6,762	7,124
United States of Colombia	3,175	6,141	6,487	4,807	6,551
Austrian Territory	.....	6,423	6,047	5,106	6,439
Uruguay	4,601	2,681	3,290	4,506	5,699
Portugal	.....	.....	6,250	6,473	5,553
Peru	2,808	4,273	2,953	4,396	5,254
West Indies	.....	.....	6,817	6,305	5,087
Greece	3,724	3,805	3,099	3,449	3,263
Other foreign countries	18,760	19,273	11,008	16,357	17,292
Other British possessions	6,039	7,825	2,942	2,752	5,487
Ecuador	1,603	2,250	1,368	2,385	1,626
China	5,118	5,367	4,267	.....	.....
Hongkong	5,109	3,850	6,766	2,940	.....
Australasia *	*10,084	.....	.....	.....	.....
Total	910,763	971,108	1,070,311	1,143,271	1,125,555

Those marked * show that 1885 Queensland and other Australian colonies are together in "Australasia;" 1886–1887 Queensland in "Australian colonies."

Fluctuations in the price of para for the past four years, from Jackson & Till's list.

Prices paid during—	1887.				1888.				1889.				1890.			
	Fine.		Negro heads.		Fine.		Negro heads.		Fine.		Negro heads.		Fine.		Negro heads.	
	s.	*d.*	*s.*	*d.*	*s.*	*d.*	*s.*	*d.*	*s.*	*d.*	*s.*	*d.*	*s.*	*d.*	*s.*	*d.*
January	3	0 –3	2	4 –2	3	3 –3	2	3¾–2	2	10¾–3	1	10½–2	2	10½–3	2	1 –2
February	3	3½–3	2	4 –2	3	1 –3	2	2 –2	2	9 –2	1	10	2	11 –3	2	0½–3
March	3	3¾–3	2	6 –2		3	2	2 –2	2	7 –2	1	8 –1	3	3½–3	2	3½–2
April	3	4½–3		2	6		3	1¾–3	2	2 –2	2	7 –2	1	7½–1	3	4½–3
May	3	4½–3	2	6 –2	7	3	0¾–2	2	3 –2	1	2	8½–2	1	9 –1	3	7½–3
June	3	5 –3	2	7 –2	5	2	10¾–3	1	10 –2	0	2	9½–2			3	8½–3
July	3	4½–3	2	5 –2	4	2	11 –3	1	10 –1	11		2	1	8½–1	3	9 –3
August	3	2 –2	1		2	4	2	11½–3	0		1	10	2	7 –2	1	7½–1
September	2	11½–3	0	2	0½–2	3	2	11 –3	0	1	10¾–1	11	2	8 –2	1	9 –1
October	2	11¼–3	0	2	0½–2	3	2	11 –3	0	1	10 –2	0	2	10 –3	1	10½–1
November	3	1 –3	2	2	2 –2	4	2	11¼–3	0	1	10¾–2	0		3	0	2
December	3	0½–3	2	3	–2	4½	2	11¾–3	0	1	10¾–2	1	3	0½–3	1	2

Prices paid during—	1890.			
	Fine.		Negro heads.	
	s.	*d.*	*s.*	*d.*
January	2	10½–3	0	2
February	2	11 –3	3	2
March	3	3½–3	6	2
April	3	4½–3	7	2
May	3	7½–3	10	2
June	3	8½–3	9	2
July	3	9 –3	10	2
August	3	10 –4	0	2
September	3	9½–4	0	2
October	3	3 –3	7	2
November				
December				

Messrs. Jackson & Till's monthly report, 1st November, 1890.

STOCK, ETC., OF INDIA RUBBER IN LONDON.

Totals, Jan. 1 to Dec. 31, 1889.			Landed.	Delivered.	Stock.		
Landed.	Delivered.				1890.	1889.	1888.
130	115	Para	22	21	14	21	14
268	330	Borneo	49	29	115	94	214
101	172	Assam	3	1	38	59	54
1,164	1,391	Other sorts	194	95	382	574	817
1,663	2,008	Total	268	146	549	748	1,099
Stock in Liverpool:							
		Para			465	620	395
		Other sorts			349	300	618
		Total United Kingdom			1,363	1,668	2,112

	Prices paid during the month.	Against same time in—	
		1889.	1888.
Para:		*s. d. s. d.*	*s. d. s. d.*
Fine	3*s.* 9*d.* to 3*s.*, spot; 3*s.* 7*d.* to 3*s.* 3*d.*, delivery.	2 10 –3 0	2 11–3 0
Negro heads	2*s.* 8*d.* to 2*s.* 7½*d.*, Manos	1 10½–1 11	1 10–2 0
Penang	2*s.* 2*d.*	2 0	2 1
Borneo	No sales	1 7½–1 8½	1 5
West India, sheet and scrap	....do	No sales ..	1 11¾
Mozambique:			
Ball and sausage	2*s.* 5*d.* to 2*s.* 3*d.*, good	1 8½–1 11	1 8–1 9½
Liver	1*s.* 11*d.* to 1*s.* 9*d.*	1 6½	1 4
Madagascar	3*s.* 1*d.* to 2*s.* 3*d.*, as in quality	.....	2 0
Loanda niggers	No sales	.....	No sales ..
Assam:			
No. 1	....do	2 0	2 3
No. 2	....do	1 7	No sales ..
No. 3	1*s.* 3*d.*	0 7 –0 9	....do .....

CORK.

REPORT BY CONSUL PIATT.

India rubber does not enter into the manufactures of this consular district. The importation of manufactures of India rubber, however, is considerable, chiefly in the form of waterproof clothing for both male and female wear, the dampness of the climate rendering such protection desirable, if not a necessity, at all seasons. These goods are brought here by local merchants from England ready-made. No American goods of the kind are used, so far as I can learn, although boots and shoes of American manufacture are brought here and used to some extent, but only through purchase from English importers of the same. No duties are imposed upon foreign manufactures of rubber.

JOHN J. PIATT,
Consul.

UNITED STATES CONSULATE,
Cork, December 8, 1890.

DUBLIN.

REPORT BY CONSUL REID.

There are no industries in this consular district engaged in the manufacture of India-rubber goods.

There is a considerable amount of rubber goods purchased in bulk by local dealers and manufactured into a variety of waterproof garments. The goods in bulk and rubber garments are purchased from London and other British firms almost exclusively. It is impossible to obtain figures showing the amount of rubber goods imported into this district. There are no goods of this description exported.

American rubber goods are to some extent consumed here, but these consist exclusively of products adapted to foot wear. These goods are purchased from London firms, who are the importers.

Goods of this description, however of any manufacture are not in general use here. The demand for them is limited.

Water-proof garments are largely used here, however. These are exclusively made of a three-ply material, the ply of rubber never being exposed, as it is lined and overlaid with cloth. The garment thus affords warmth as well as protection from rain.

I am informed by the local dealers that the objection, in this market, to water-proof goods of American manufacture is that the rubber surface is exposed upon the exterior. For this reason, from the standpoint of this market, they are not as durable or so presentable as the cloth-covered and cloth-lined goods. To meet these objections would seem to be the first step necessary to extend the trade of American manufacturers of rubber goods in this market.

ALEX J. REID,
Consul.

UNITED STATES CONSULATE,
Dublin, Ireland, October 25, 1890.

DUNFERMLINE.

REPORT BY COMMERCIAL AGENT REID.

This district is peculiar and reports from it must be meager of interest or information. The whole territory of Fife is only a little over 40 miles long by 18 wide, fully one-third of which is represented by Dundee. It has only two important towns, in neither of which, outside of the great linen and linoleum factories, is there any wholesale house, indeed, any house whose supplies, except in a few limited specialties, come from beyond Edinburg or Glasgow. In making my inquiries I meet with a somewhat resentful feeling caused by recent American legislation.

India-rubber goods are purchased by dry goods and shoe houses in

very limited quantities from the large rubber houses of Edinburg and Glasgow. The amount can not be exactly ascertained even under the most courteous inquiry, but it is, unquestionably, too limited to predicate any new or changed demand until American goods of equal or increased value are offered at convenient places of supply on equal or lower terms.

There are no direct imports of rubber goods from the United States so far as can be learned.

There seems a preference for American-made rubber boots and shoes, especially for ladies' wear, and which are obtained from a Boston agency in Glasgow.

The establishment of supply centers of easy access, or by personal visitation as is here vigorously done, and advantageous rates, are the natural and only means of introducing successfully American traffic.

JAMES D. REID,
Commercial Agent.

UNITED STATES COMMERCIAL AGENCY,
Dunfermline, October 27, 1890.

LEEDS.

REPORT BY CONSUL WIGFALL.

Sundry efforts to obtain the information desired by the Department, with regard to the manufacture and distribution of caoutchouc in this district, have resulted unsatisfactorily, by reason of combined indisposition and inability to answer on the part of those applied to.

From what has been gathered, however, through the search it may be assumed that there are, properly speaking, no manufactures of India rubber in the Leeds district.

There are a number of establishments which deal in the finished product, and there may be something done in a minor way as to making up garments from the tissues prepared in other districts; but, so far as I am advised, there are no firms here engaged in handling the crude material.

It may be added that there is a leather and rubber boot company established here, which makes boots by a patent process of alternate layers of rubber and leather in the sole.

Much India rubber, doubtless, is also used in connection with the manufacture here of machinery, etc.; but it would seem presumable that these auxiliary parts are made elsewhere in the first instance and brought into the district ready, or approximately ready, for application.

India-rubber overshoes are not worn so universally here as in the northern United States. Cloaks and wraps, however, both for men and women, are much in vogue, and the employment of the material for surgical and sanitary purposes is carried to a great extent.

An abstract from a catalogue attached hereto* shows cloaks, wraps, overcoats, carriage and stable appliances, shooting and fishing articles, hose, riding boots, tennis balls and shoes, pillows, cushions, baths, beds, sheets, belts, bandages, and other things for hospital and surgical purposes, door mats, cricket bats, tobacco pouches, football bladders, bags, portmanteaus, cart and rick covers, and bicycle tires. No doubt the list exhibits but approximately the numerous and various methods of using this marvelous material.

Edinburg, in Scotland, and London and Manchester, in England, are three centers of manufacturing production, and perhaps the most important in the Kingdom in this line of industry.

There is no duty imposed on imports into the United Kingdom, either of the raw material or the goods made therefrom.

There is hardly an export trade from this district of proportions worth mentioning. The trade here, as already indicated, is chiefly of distribution among the consumers of the neighborhood, except so far as India rubber may enter incidentally into the construction of articles mainly composed of other material.

Germany and France are probably the chief sources of supply for foreign manufactured goods. So far as my impression goes, the United States do not send much into this district of these goods. There is perhaps a tendency on the part of the trade here to consider the American product of shoes, for example, as not sufficiently substantial. On the other hand, American clothes-wringers are well spoken of, as indicating skill in manipulation of the rubber, which is a main component of the article.

A suggestion which occurs with reference to extending the American trade here is, in effect, that in order to obtain trade it is necessary to solicit it. If the prices indicated in the catalogue annexed leave enough margin for distributive expenses and adequate profits, there would seem to be no reason to doubt that a well-advised endeavor, backed by sufficient capital, would meet with success. Personal solicitation alone might answer. This being combined with branch houses and stocks in hand, the result would be still more sure.

Trade here now is, in a general way, in good condition; and while the crisis of energy has probably been passed, there appears to still remain the prospect of a some time continuing prosperity.†

The British Encyclopedia gives the imports of India rubber into England as rising from 464 hundredweights in 1830 to 6,640 in 1840, 7,616 in 1850, and 152,118 twenty years later, in 1870.

For the years 1842 to 1855, inclusive, Mr. Thomas Hancock, in his

* Omitted.

† This was written before the coming to light of the grave disturbance which has just transpired in the banking world at London. What results in the near future may accrue will shortly appear. The current condition of trade represented above must, of course, be regarded subject to those results.

Personal Narrative (London, Longmans, 1857), gives the imports of India rubber to the United Kingdom at 18,541,600 pounds, ranging in annual amounts from 317,184 pounds (2,832 hundredweights) in 1842 to 5,006,736 pounds (44,703 hundredweights) in 1855, and derived in gross from the following sources in the amounts named, respectively:

	Pounds.
East Indies	2,623,936
United States	950,880
Brazil	11,825,968
Java	1,060,752
Elsewhere	2,080,064
Total (165,550 hundredweights)	18,541,600

He states the exports of raw material for the same period as 4,839,520 pounds, to the following districts:

	Pounds.
Russia	390,880
Hause Towns	774,816
Holland	560,672
Belgium	1,034,544
France	694,064
United States	1,328,992
Elsewhere	55,552
Total (43,210 hundredweights)	4,839,520

These figures for fourteen years show a reëxport amounting to about 26 per cent of the gross imports.

The board of trade returns show an import (gross) for eleven years, from 1879 to 1889, inclusive, of 2,151,792 hundredweights, ranging from 148,329 hundredweights in 1879 to 236,274 hundredweights in 1889 against the figures for 1842–1855 of 2,832 hundredweights and 44,705 hundredweights.

The exports of raw caoutchouc for the eleven years 1879–1889, inclusive, by the board of trade returns, are 1,151,265 hundredweights, or about 53½ per cent of the gross imports, showing a distributive energy in the English markets more than doubled from the one period to the other, reckoned by percentage of the whole movement in each instance.

The table appended below is compiled from the board of trade returns, 1879–1890. A comparison for the ten months of 1888–'89–'90 shows the latest figures at hand, and indicates an increased trade as to quantity during the current year over any previous one.

Year.	Manufactures of caoutchouc.		Raw caoutchouc.					
	Exports from United Kingdom.		Exports from United Kingdom.			Imports to United Kingdom.		
			Cwt.			*Cwt.*		
1879	£761,717	$3,706,895.78	90,730	£1,003,505	$4,883,849.07	148,329	£1,588,786	$7,731,827.07
1880	833,837	4,057,867.76	76,710	1,063,420	5,175,133.43	166,459	2,354,069	11,456,076.79
1881	939,172	4,570,480.54	94,631	1,174,829	5,717,305.33	169,469	2,212,364	10,766,469.41
1882	999,529	4,864,207.88	101,654	1,537,568	7,482,574.67	179,907	2,729,298	13,282,128.72
1883	1,070,365	5,208,931.27	102,570	1,463,331	7,121,300.31	227,422	3,618,276	17,608,340.15
1884	1,004,739	4,889,518.55	109,856	1,155,489	5,623,187.22	198,001	2,266,870	11,031,722.85
1885	910,763	4,432,228.14	92,272	918,955	4,472,094.51	179,703	1,975,658	9,614,539.66
1886	971,108	4,725,897.08	109,416	1,281,499	6,236,414.88	192,518	2,202,746	10,719,661.41
1887	1,070,311	5,208,668.48	116,570	1,341,643	6,529,105.66	235,539	2,682,545	13,054,605.21
1888	1,143,271	5,563,728.32	127,814	1,335,835	6,500,841.03	218,171	2,529,436	12,309,500.29
1889	1,124,787	5,473,775.94	129,042	1,394,247	6,785,103.03	236,274	2,612,704	12,714,724.02
11 years	10,829,590	52,702,199.74	1,151,265	13,670,381	66,526,909.14	2,151,792	26,772,752	130,289,597.61
10 months, January to October:								
1890	1,012,965	4,929,594.17	120,502	1,455,774	7,084,524.17	203,593	2,504,835	12,189,779.53
1889	933,208	4,541,456.73	106,774	1,149,369	5,593,404.24	195,062	2,163,233	10,527,373.40
1888	955,258	4,648,763.06	104,930	1,103,714	5,371,224.18	172,962	1,976,596	9,619,101.43
	2,901,431	14,119,813.96	332,206	3,708,857	18,049,152.59	571,617	6,644,664	32,336,257.36

The principal sources were given by the Encyclopedia (issue of 1881) as follows, in order of value: South America, Central America, Africa, Asiatic.

The Pará rubber, from South America, was called the most important. The African product was reckoned to take the second place as to quantity produced. A considerable amount of this product was reported coming to Great Britain, but regarded as inferior in quality to the Pará.

Pará rubber was credited with 1,670 tons in 1857 and 8,000 tons in 1879 of imports; but the last-named amount would seem discrepant from the figures of the board of trade returns for the same year, which give a total import for 1879, from all sources, of only 7,416 tons, 9 hundredweights.

Some other supplies indicated were Ceara (Rio Janeiro), Cartagena, and Guayaquil (the bulk of these two said to go to the United States, as is also reported to be the case with reference to the general Central American export, especially that from Nicaragua and Panama).

A small amount of "West India" (Central American in origin, but so called from its transport in West India steamers) was said to be brought to England. This latter was called the best quality of Central American rubber.

From Honduras and Mexico the imports were rare or of small amount.

The Asiatic countries also sent rubber to England. Three-fourths of the India export was credited to Great Britain and one-fourth to the

United States. The Assam rubber came chiefly from Calcutta. Borneo was another small source; as were also Rangoon, Penang, and Java. Sumatra and Malacca were said to not contribute to the English supply.

The accompanying extracts from English papers of recent date indicate an active interest in the question of the rubber supply.

[London Times, November 5, 1890.]

THE NEW WEST AFRICAN EXPEDITION.

The expedition to Lagos under Mr. James Bennett, with Commander Cameron as his chief staff, will leave England in the yacht *Fawn* on Saturday or Monday next. The party will consist of twenty-four all told, and it is computed that they will be absent six months. The following official notice regarding the expedition has been issued from the colonial office:—

"Notice is given hereby that the colony will shortly be visited by Mr. James Bennett, of London, charged by the right honorable the Secretary of State for the colonies with the duty of inquiring into and reporting upon the mineral and vegetable resources of the colony with a view to their further development. Mr. Bennett, besides being a gentleman of large experience both as a consulting mining engineer and in commerce, is the inventor of a special process for extracting, by means of chemicals, pure rubber from the milk of the wild fig tree, of which several species are to be found in the colony, and it is hoped that great advantage will accrue to the colony and adjoining territories from his visit. He will devote particular attention to those articles, such as rubber, gums, fibers, and minerals, in which it is thought that the present trade of the colony may be largely increased, or which are considered apt to become subjects of local manufacture. His excellency the governor trusts that the people of the colony, and especially the important commercial body, will place their valuable local knowledge at Mr. Bennett's disposal, and otherwise render him every assistance calculated to make his visit prove useful to the colony.

By command:

OLIVER SMITH,
Acting Colonial Secretary.

The COLONIAL SECRETARY'S OFFICES,
Lagos, March 28, 1890.

Mr. Bennett will visit various other places on the coast, and has received the following letter from the colonial office:

DOWNING STREET, *October 25, 1890.*

"SIR: In reply to your letter of 20th instant, I am directed by Lord Knutsford to acquaint you that he will be glad to instruct the governors of the various West African colonies which you propose to visit to afford you every facility and all the information and assistance in their power. As, however, there has not been time to communicate with them in advance, his lordship is unable to make any pecuniary arrangement such as has been sanctioned in the case of Lagos. I am to add that Lord Knutsford has no objection to your undertaking any commission you may think proper for the development of trade. I am to state that the Oil rivers are not under the control of this department, but of the Foreign Office.

"I am, sir, your obedient servant,

"JOHN BRAMSTON."

[Leeds Mercury, November 11, 1890.]

The new expedition to Africa by Mr. James Bennett and Commander Cameron is for the purpose of finding out the possibilities of fresh trade on the West Coast, up the Gambia, the Oil, and other rivers. There are many materials of value not yet

exchanged by the natives with the traders, and india rubber is to have special attention, Mr. Bennett having a process by which the crude material can be so purified as to go at once into the hands of the manufacturer. It is not proposed to trade on this trip, but simply to ascertain what trade may be done. Two or three English ships leave the West Coast every week at present with cargoes valued at from £200,000 to £300,000, and there is thus a fine opening for enterprise. With palm oil at £40 per ton and India rubber at from £200 to £500 per ton, Commander Cameron may well say that "the old Spanish galleons are not to be compared with the vessels of to-day." The expedition goes out in a small steamer of 45 tons register.

[Yorkshire Post, November 15, 1890.]

MR. BENNETT'S EXPEDITION TO WEST AFRICA—WITHDRAWAL OF OFFICIAL SUPPORT.

With reference to the statement regarding the proposed expedition to West Africa, it is announced that the colonial office, finding that the objects of Mr. Bennett's expedition are not of a merely scientific character, as had been supposed, has withdrawn the introductions to the governors of the Gambia, Sierra Leone, and Gold Coast colonies; and that Commander Lovett Cameron has informed Mr. Bennett that he has severed himself from the expedition, and holds Mr. Bennett responsible for all loss and damage. Commander Cameron's interview with Lord Knutsford on Wednesday was for the purpose of explaining that his connection with Mr. Bennett has been terminated. Mr. Bennett never received a direct appointment from the colonial office, although the governor of Lagos was authorized to arrange for his visit to that colony. All this quasi-official support, however, has now been withdrawn.

[Yorkshire Evening Post, November 15, 1890.]

The withdrawal of official support from the proposed expedition of the *Fawn* to the West Coast of Africa is generally regarded as an indirect consequence of the revelations of the week upon African exploration. The colonial office, on the ground that it finds the objects of Mr. Bennett's expedition to be not merely of a scientific character, has taken back the introductions to the governors of the Gambia, Sierra Leone, and Gold Coast colonies, and pressure has been brought to bear, it seems, upon Commander Lovell Cameron to sever himself from the expedition.

F. H. WIGFALL,
Consul.

UNITED STATES CONSULATE,
Leeds, November 17, 1890.

LEITH.

REPORT BY CONSUL BRUCE.

THE MANUFACTURES OF INDIA RUBBER.

As to the manufacture of rubber goods the output of this district will be about $2,500,000, the leading article of the same being rubber shoes and boots. Next to boots and shoes are goods for mechanical purposes, to wit, hose, belting, etc. Third on the list of manufactured goods are clothing, viz, waterproofs, gossamers, etc. These goods are exported all over the world, except to the United States and Russia. Australia and New Zealand are the largest consumers—after these India and South America.

The North British Rubber Company, limited, in this city, is the largest in Great Britain, and the price lists of same are inclosed herein.

The rubber used in Great Britain is imported free of duty.

There are scarcely any manufactured rubber goods imported in this consular district. I am informed that France and Germany compete for some of the trade in Great Britain, and sell about $500,000 worth of rubber shoes annually. Three or four years ago the competition was strong. Now there is an understanding between the manufacturers in Great Britain and on the continent so that cutting in prices has generally stopped. The manufacturers of the three nations meet yearly and arrange the prices satisfactorily among themselves.

There are practically no rubber goods sent from the United States to this district or in fact to Great Britain. I am informed that whatever goods are sent are for the most part sent to London, presumably for resident Americans.

There are no duties imposed on foreign manufactures of rubber in this country.

I am informed that American goods are regarded here as inferior in quality or durability. This, however, is not my own experience, nor the judgment of American travelers who have tested both British and American manufactures, and it is conceded by the manufacturers here that for the art of manufacture American rubber goods are equal to any in the market.

I might add that the North British Rubber Company, Limited, has a capital stock of $1,750,000. The Scottish Vulcanite Company, also of Edinburg, is the largest manufactory of hard-rubber goods in Great Britain, and is stocked for $875,000, many of the shareholders being the same as those of the North British Company. The Vulcanite Company manufactures largely for the home trade of Great Britain, but sells some goods in France, Germany, and Canada. Their trade with the United States is limited.

It would require, in my judgment, much energy and considerable expense on the part of American manufacturers or dealers to obtain a profitable trade in this country. It would call for first-class agents to introduce the goods. Conservative people take slowly to anything new, or to goods in any way differing from what they are accustomed to wear. I might add that rubber overshoes are rarely worn in this country. It is not often that one sees a rubber overshoe even in wet weather. Ladies and gentlemen wear, for the most part, clumsier and heavier shoes than we do either in New York or in the Sierra Nevadas. Waterproofs, or "mackintoshes," are worn here perhaps more than in the United States. One would think that there was an opening in the large cities of Great Britain for a first-class American shoe store, where newer patterns of shoes, more graceful and better made than those here obtainable, could be had; and such an establishment, if successful, might introduce rubber goods which are made in America.

WALLACE BRUCE.

UNITED STATES CONSULATE FOR LEITH, *Consul.*

Edinburgh, November 3, 1890.

LIVERPOOL.

REPORT BY CONSUL SHERMAN.

The only rubber manufactory in Liverpool is the Liverpool Rubber Company, Limited. The articles manufactured by this company are garden hose, boots and shoes, sheet tubing, and cord rubber, and other sundry articles for mechanical purposes. Rubber clothing is not manufactured in this district. The output of the Liverpool Rubber Company is about 3,000 to 4,000 pairs of boots and shoes per day.

There are no reliable statistics from which could be quoted the export of the several articles of rubber manufactures from this district, but I learn that the articles manufactured by the Liverpool Rubber Company are exported to all countries not tropical. The board of trade returns show that the value of caoutchouc manufactures (the produce of the United Kingdom) exported from this country during the year 1889 amounted to £1,125.55 ($5,470,197). The value and the countries to which exported are as follows:

Countries.	Value.	Equivalent in U. S. currency.	Countries.	Value.	Equivalent in U. S. currency.
Russia	£16,298	$79,313	Italy	£15,803	$76,904
Sweden and Norway	32,580	158,550	Austrian territories	6,439	31,334
Denmark	12,232	59,526	Turkey	14,960	72,801
Germany	179,857	875,273	Japan	11,997	58,383
Holland	76,124	370,456	United States of America	56,284	273,905
Belgium	121,231	589,970	Mexico	25,453	123,866
France	201,632	981,241	United States of Colombia	6,551	31,877
Portugal, Madeira	5,556	27,022	Other countries	118,567	576,235
Spain and Canaries	17,022	82,837	British Possessions	206,972	1,005,883

In addition there were exported from this country foreign manufactures of caoutchouc amounting to £27,077 ($131,769).

The discounts vary according to circumstances. Price lists of manufacturers of rubber goods who have agencies in this city are also annexed.

All of the crude rubber used here is imported, and admitted duty free.

So far as can be ascertained, there are no rubber manufactures imported into Liverpool. These articles are imported into London from the United States, France, Germany, Holland, and Belgium, and through agencies there forwarded to the provinces for sale.

The value of caoutchouc manufactures imported into Great Britain during the year 1889 was £318,439 ($1,549,683), weighing 3,132,976 pounds. The value and the countries from which imported are as follows:

Countries.	Value.	Equivalent in U. S. currency.	Countries.	Value.	Equivalent in U. S. currency.
Germany	£165,135	$803,628	France	58,567	285,016
Holland	27,381	133,249	United States of America	50,397	245,253
Belgium	15,326	74,583	Other foreign countries	1,483	729

The value of caoutchouc imported into Great Britain during the same period was £2,617,369 ($12,720,413), and weighed 236,310 hundredweights.

The import of caoutchouc into Liverpool during 1889 was 188,806 hundredweights.

Manufactures of rubber imported into this country are admitted duty free.

The only articles of American manufacture sold in this district are boots and shoes. These compare most favorably with those of the Liverpool Rubber Company, those manufactured in other parts of the country, and those imported on account of their being slightly cheaper and of better finish. In addition to these advantages, the American manufactured boots are preferred on account of their being more durable and not so liable to crack.

With the advantages that American boots and shoes have over those imported or manufactured here, it is believed that a much greater sale would follow their being placed more prominently before the public.

It is well to note here that rubber overshoes are worn only to a very limited extent.

THOS. H. SHERMAN,
Consul.

UNITED STATES CONSULATE,
Liverpool, December 24, 1891.

GLASGOW.

REPORT BY CONSUL BROWN.

I find that almost every kind of goods of which rubber forms the whole or a constituent part is manufactured in this district, boots and shoes being the only notable exception. There are no less than five extensive manufactories of rubber goods situate in Glasgow and its immediate vicinity, only two of which, however, manufacture from the crude rubber. If any classes or lines of goods manufactured here might be considered specialties, it would be waterproof clothing, which is manufactured in great variety and in large quanties. Next to this class of goods, rubber belting, hose, tubing, etc., is manufactured most extensively. These goods are exported to Spain, Portugal, and the northern countries of Europe, in limited quantities, and largely to Australia and other British colonies throughout the world.

A very little is exported to the United States, the total value for the last six months being but $5,000, and consisted solely of waterproof clothing and waterproof piece goods, and a single small consignment of rubber overshoes.

I am informed that there is scarcely any importation of the manufactures of rubber, except from the United States, and the amount im-

ported from the United States is not large. The actual amount imported from the United States for six months ending December 1, 1890, was 1,753 cases (and packages of all kinds), weighing 72,730 pounds, and of the value of $32,560. I understand a portion of this amount was rubber in barrels, for remanufacture, but much the largest item of the above consisted of boots and shoes. I have heard but a single criticism upon American rubber goods, but I imagine I might have heard the same criticism repeated had I made further inquiry, and that was that American rubber goods are not heavy and durable enough, though it is admitted that the quality, for the weight, is satisfactory. The only suggestion that can be offered in relation to question nineteen is, if American rubber manufacturers are desirous of extending their trade in this direction, they must not only produce good goods (which I believe they are now doing), but undersell the home manufacturer.

L. W. BROWN,
Consul.

UNITED STATES CONSULATE,
Glasgow, December 18, 1890.

LONDON.

REPORT BY CONSUL-GENERAL NEW.

Manufactures.—London is one of the chief, if not the chief, centers of India-rubber manufacture. There are a large number of manufactories in and around London where India-rubber goods of all kinds are manufactured, the principal of which are India-rubber clothing, balls, and balloons, belting, India-rubber canvas shoes, door springs, floor cloth, hose, machine belting, mats, overshoes, bicycle tires, stamps, and steam packing.

Exports.—The countries to which manufactures of India rubber are exported are as follows (the values are for 1889):

Countries.	Value.	Countries.	Value.
Russia	$81,490	Chile	$67,710
Sweden and Norway	162,900	Brazil	181,425
Denmark	61,165	Argentine Republic	186,075
Germany	899,280	Other foreign countries	157,625
Holland	380,620		
Belgium	606,155	Total	4,592,915
France	1,008,160	British Possessions in—	
Portugal	27,765	South Africa	74,805
Spain	85,110	East Indies	229,670
Italy	79,015	Australasia	569,770
Austria	32,195	North America	107,745
Turkey	74,800	West Indies	25,435
Japan	59,985	Other British Possessions	27,435
United States of America	281,420		
Mexico	127,265	Grand total	5,627,775
United States of Colombia	32,755		

Duties.—There is no duty on raw rubber or on the manufactured goods in this country.

IMPORTS.

Caoutchouc.—The following table gives the quantity and value of caoutchouc imported into this country in 1889, and the countries whence imported:

Countries.	Quantity.	Value.	Countries.	Quantity.	Value.
	Cwt.			*Cwt.*	
Germany	7,422	$249,230	Other foreign countries	1,411	$35,440
Holland	2,568	101,230	Total foreign countries	196,799	11,500,175
Belgium	1,257	53,875			
France	6,674	170,305	British Possessions in—		
Portugal	9,176	487,245	West Africa	13,545	527,130
West Africa	26,655	918,135	Gold Coast	5,760	204,530
East Africa	3,962	180,620	South Africa	495	18,405
Madagascar	3,709	183,650	Aden	4,425	197,870
United States of America	9,927	254,060	East Indies	14,908	625,475
Central America	205	11,255	Other British Possessions	288	13,260
United States of Colombia	879	57,590			
Ecuador	295	19,910	Grand total	236,310	13,086,845
Brazil	122,649	8,777,590			

Manufactured goods.—The quantity and value of manufactured rubber goods imported into the United Kingdom from foreign countries in 1889 were as follows:

Countries.	Quantity.	Value.
	Pounds.	
Germany	1,943,997	$825,675
Holland	182,246	136,905
Belgium	86,416	76,630
France	482,767	292,835
United States of America	416,388	251,985
Other foreign countries	20,062	7,415
Total	3,131,876	1,591,445
British Possessions	1,100	750
Grand total	3,132,976	1,592,195

AMERICAN RUBBER GOODS.

Imports.—The amount of rubber manufactures imported from the United States in 1889 was 416,388 pounds of the value of $251,985. In 1888 the amount was 374,410 pounds of the value of $204,950. It is not possible to give the separate items.

Quality.—It is considered in the trade that American waterproofs and rubber shoes are capable of holding their own against all but the very highest priced of those articles made in this country.

How to increase trade.—The only way I can suggest to American rubber manufacturers to extend their business is to appoint agents here to show their goods. There are already one or two American firms who have agents established in London.

JOHN C. NEW,
Consul-General.

UNITED STATES CONSULATE-GENERAL,
London, November 29, 1890.

MANCHESTER.

REPORT BY CONSUL FOLSOM.

In this consular district there are but few (if any) rubber goods imported directly from the United States, purchases being made in London and elsewhere. There are no duties imposed upon foreign manufactures of India rubber. The greater part of American rubber goods seen here are not considered superior to those of English manufacture. The only suggestion that can be offered to manufacturers desiring to extend their trade into this district is that they should be able to supply the purchaser with superior goods at equal or lower rates than those of English or foreign manufacture.

BENJAMIN FOLSOM,
Consul.

UNITED STATES CONSULATE,
Sheffield, December 8, 1890.

CONTINENT OF AMERICA.

DOMINION OF CANADA.

FORT ERIE.

REPORT BY CONSUL BEDELL.

India rubber is not manufactured in this district. Occasionally boots, shoes, clothing, belting, etc., are imported from Buffalo, amount not to exceed $500 per annum, on which there is a duty of 25 to 30 per cent ad valorem. No crude is imported. Nothing can be done for American manufacturers, as the duty practically prohibits the sale of American goods here, excepting where better goods are required than those manufactured in this country.

OSSIAN BEDELL,
Consul.

UNITED STATES CONSULATE,
Fort Erie, October 18, 1890.

GASPÉ BASIN.

REPORT BY CONSUL DICKSON.

There are no rubber goods of any kind manufactured in this district, nor are there any rubber goods to speak of imported into this district from the United States direct, although about one-half of the rubber goods sold here are of American make; the merchants procure them through jobbing houses at Montreal and Quebec.

American rubber goods are regarded here far superior to Canadian, and sell for one-third more. Rubber boots and shoes are the main kinds of rubber goods used here, and they are used to a large extent.

The duties on rubber goods in the Dominion of Canada are 25 per cent.

In regard to the last question, contained in this circular, my suggestion to the rubber manufacturers would be to send their price lists to this Consulate, and I will cheerfully give them to the large dealers.

ALMAR F. DICKSON,
Consul.

UNITED STATES CONSULATE,
Gaspé Basin, Quebec, November 15, 1890.

DUBLIN.

REPORT BY CONSUL REID.

There are no industries in this consular district engaged in the manufacture of India-rubber goods.

There is a considerable amount of rubber goods purchased in bulk by local dealers and manufactured into a variety of waterproof garments. The goods in bulk and rubber garments are purchased from London and other British firms almost exclusively. It is impossible to obtain figures showing the amount of rubber goods imported into this district. There are no goods of this description exported.

American rubber goods are to some extent consumed here, but these consist exclusively of products adapted to foot wear. These goods are purchased from London firms, who are the importers.

Goods of this description, however of any manufacture are not in general use here. The demand for them is limited.

Water-proof garments are largely used here, however. These are exclusively made of a three-ply material, the ply of rubber never being exposed, as it is lined and overlaid with cloth. The garment thus affords warmth as well as protection from rain.

I am informed by the local dealers that the objection, in this market, to water-proof goods of American manufacture is that the rubber surface is exposed upon the exterior. For this reason, from the standpoint of this market, they are not as durable or so presentable as the cloth-covered and cloth-lined goods. To meet these objections would seem to be the first step necessary to extend the trade of American manufacturers of rubber goods in this market.

ALEX J. REID,
Consul.

UNITED STATES CONSULATE,
Dublin, Ireland, October 25, 1890.

DUNFERMLINE.

REPORT BY COMMERCIAL AGENT REID.

This district is peculiar and reports from it must be meager of interest or information. The whole territory of Fife is only a little over 40 miles long by 18 wide, fully one-third of which is represented by Dundee. It has only two important towns, in neither of which, outside of the great linen and linoleum factories, is there any wholesale house, indeed, any house whose supplies, except in a few limited specialties, come from beyond Edinburg or Glasgow. In making my inquiries I meet with a somewhat resentful feeling caused by recent American legislation.

India-rubber goods are purchased by dry goods and shoe houses in

very limited quantities from the large rubber houses of Edinburg and Glasgow. The amount can not be exactly ascertained even under the most courteous inquiry, but it is, unquestionably, too limited to predicate any new or changed demand until American goods of equal or increased value are offered at convenient places of supply on equal or lower terms.

There are no direct imports of rubber goods from the United States so far as can be learned.

There seems a preference for American-made rubber boots and shoes, especially for ladies' wear, and which are obtained from a Boston agency in Glasgow.

The establishment of supply centers of easy access, or by personal visitation as is here vigorously done, and advantageous rates, are the natural and only means of introducing successfully American traffic.

JAMES D. REID,
Commercial Agent.

UNITED STATES COMMERCIAL AGENCY,
Dunfermline, October 27, 1890.

LEEDS.

REPORT BY CONSUL WIGFALL.

Sundry efforts to obtain the information desired by the Department, with regard to the manufacture and distribution of caoutchouc in this district, have resulted unsatisfactorily, by reason of combined indisposition and inability to answer on the part of those applied to.

From what has been gathered, however, through the search it may be assumed that there are, properly speaking, no manufactures of India rubber in the Leeds district.

There are a number of establishments which deal in the finished product, and there may be something done in a minor way as to making up garments from the tissues prepared in other districts; but, so far as I am advised, there are no firms here engaged in handling the crude material.

It may be added that there is a leather and rubber boot company established here, which makes boots by a patent process of alternate layers of rubber and leather in the sole.

Much India rubber, doubtless, is also used in connection with the manufacture here of machinery, etc.; but it would seem presumable that these auxiliary parts are made elsewhere in the first instance and brought into the district ready, or approximately ready, for application.

India-rubber overshoes are not worn so universally here as in the northern United States. Cloaks and wraps, however, both for men and women, are much in vogue, and the employment of the material for surgical and sanitary purposes is carried to a great extent.

An abstract from a catalogue attached hereto* shows cloaks, wraps, overcoats, carriage and stable appliances, shooting and fishing articles, hose, riding boots, tennis balls and shoes, pillows, cushions, baths, beds, sheets, belts, bandages, and other things for hospital and surgical purposes, door mats, cricket bats, tobacco pouches, football bladders, bags, portmanteaus, cart and rick covers, and bicycle tires. No doubt the list exhibits but approximately the numerous and various methods of using this marvelous material.

Edinburg, in Scotland, and London and Manchester, in England, are three centers of manufacturing production, and perhaps the most important in the Kingdom in this line of industry.

There is no duty imposed on imports into the United Kingdom, either of the raw material or the goods made therefrom.

There is hardly an export trade from this district of proportions worth mentioning. The trade here, as already indicated, is chiefly of distribution among the consumers of the neighborhood, except so far as India rubber may enter incidentally into the construction of articles mainly composed of other material.

Germany and France are probably the chief sources of supply for foreign manufactured goods. So far as my impression goes, the United States do not send much into this district of these goods. There is perhaps a tendency on the part of the trade here to consider the American product of shoes, for example, as not sufficiently substantial. On the other hand, American clothes-wringers are well spoken of, as indicating skill in manipulation of the rubber, which is a main component of the article.

A suggestion which occurs with reference to extending the American trade here is, in effect, that in order to obtain trade it is necessary to solicit it. If the prices indicated in the catalogue annexed leave enough margin for distributive expenses and adequate profits, there would seem to be no reason to doubt that a well-advised endeavor, backed by sufficient capital, would meet with success. Personal solicitation alone might answer. This being combined with branch houses and stocks in hand, the result would be still more sure.

Trade here now is, in a general way, in good condition; and while the crisis of energy has probably been passed, there appears to still remain the prospect of a some time continuing prosperity.†

The British Encyclopedia gives the imports of India rubber into England as rising from 464 hundredweights in 1830 to 6,640 in 1840, 7,616 in 1850, and 152,118 twenty years later, in 1870.

For the years 1842 to 1855, inclusive, Mr. Thomas Hancock, in his

* Omitted.

† This was written before the coming to light of the grave disturbance which has just transpired in the banking world at London. What results in the near future may accrue will shortly appear. The current condition of trade represented above must, of course, be regarded subject to those results.

Personal Narrative (London, Longmans, 1857), gives the imports of India rubber to the United Kingdom at 18,541,600 pounds, ranging in annual amounts from 317,184 pounds (2,832 hundredweights) in 1842 to 5,006,736 pounds (44,703 hundredweights) in 1855, and derived in gross from the following sources in the amounts named, respectively:

	Pounds.
East Indies	2,623,936
United States	950,880
Brazil	11,825,968
Java	1,060,752
Elsewhere	2,080,064
Total (165,550 hundredweights)	18,541,600

He states the exports of raw material for the same period as 4,839,520 pounds, to the following districts:

	Pounds.
Russia	390,880
Hause Towns	774,816
Holland	560,672
Belgium	1,034,544
France	694,064
United States	1,328,992
Elsewhere	55,552
Total (43,210 hundredweights)	4,839,520

These figures for fourteen years show a reëxport amounting to about 26 per cent of the gross imports.

The board of trade returns show an import (gross) for eleven years, from 1879 to 1889, inclusive, of 2,151,792 hundredweights, ranging from 148,329 hundredweights in 1879 to 236,274 hundredweights in 1889 against the figures for 1842–1855 of 2,832 hundredweights and 44,705 hundredweights.

The exports of raw caoutchouc for the eleven years 1879–1889, inclusive, by the board of trade returns, are 1,151,265 hundredweights, or about 53½ per cent of the gross imports, showing a distributive energy in the English markets more than doubled from the one period to the other, reckoned by percentage of the whole movement in each instance.

The table appended below is compiled from the board of trade returns, 1879–1890. A comparison for the ten months of 1888–'89–'90 shows the latest figures at hand, and indicates an increased trade as to quantity during the current year over any previous one.

Year.	Manufactures of caoutchouc.		Raw caoutchouc.					
	Exports from United Kingdom.		Exports from United Kingdom.			Imports to United Kingdom.		
			Cwt.			Cwt.		
1879.....	£761,717	$3,706,895.78	90,730	£1,003,565	$4,883,849.07	148,329	£1,588,786	$7,731,827.07
1880.....	833,837	4,057,867.76	76,710	1,063,420	5,175,133.43	166,459	2,354,069	11,456,076.79
1881.....	939,172	4,570,480.54	94,631	1,174,829	5,717,305.33	169,469	2,212,364	10,766,469.41
1882.....	999,529	4,864,207.88	101,654	1,537,568	7,482,574.67	179,907	2,729,298	13,282,128.72
1883.....	1,070,365	5,208,931.27	102,570	1,463,331	7,121,300.31	227,422	3,618,276	17,608,340.15
1884.....	1,004,739	4,889,518.55	109,856	1,155,489	5,623,187.22	198,001	2,266,870	11,031,722.85
1885.....	910,763	4,432,228.14	92,272	918,955	4,472,094.51	179,703	1,975,658	9,614,539.66
1886.....	971,108	4,725,897.08	109,416	1,281,499	6,236,414.88	192,518	2,202,746	10,719,663.41
1887.....	1,070,311	5,208,668.48	116,570	1,341,643	6,529,105.66	235,539	2,682,545	13,054,605.21
1888.....	1,143,271	5,563,728.32	127,814	1,335,835	6,500,841.03	218,171	2,529,436	12,309,500.29
1889.....	1,124,787	5,473,775.94	129,042	1,394,247	6,785,103.03	236,274	2,612,704	12,714,724.02
11 years.	10,829,590	52,702,199.74	1,151,265	13,670,381	66,526,909.14	2,151,792	26,772,752	130,289,597.61
10 months, January to October:								
1890...	1,012,965	4,929,594.17	120,502	1,455,774	7,084,524.17	203,593	2,504,835	12,189,779.53
1889...	933,208	4,541,456.73	106,774	1,149,369	5,593,404.24	195,062	2,163,233	10,527,373.40
1888...	955,258	4,648,763.06	104,930	1,103,714	5,371,224.18	172,962	1,976,596	9,619,101.43
	2,901,431	14,119,813.96	332,206	3,708,857	18,049,152.59	571,617	6,644,664	32,336,257.36

The principal sources were given by the Encyclopedia (issue of 1881) as follows, in order of value: South America, Central America, Africa, Asiatic.

The Pará rubber, from South America, was called the most important. The African product was reckoned to take the second place as to quantity produced. A considerable amount of this product was reported coming to Great Britain, but regarded as inferior in quality to the Pará.

Pará rubber was credited with 1,670 tons in 1857 and 8,000 tons in 1879 of imports; but the last-named amount would seem discrepant from the figures of the board of trade returns for the same year, which give a total import for 1879, from all sources, of only 7,416 tons, 9 hundredweights.

Some other supplies indicated were Ceara (Rio Janeiro), Cartagena, and Guayaquil (the bulk of these two said to go to the United States, as is also reported to be the case with reference to the general Central American export, especially that from Nicaragua and Panama).

A small amount of "West India" (Central American in origin, but so called from its transport in West India steamers) was said to be brought to England. This latter was called the best quality of Central American rubber.

From Honduras and Mexico the imports were rare or of small amount.

The Asiatic countries also sent rubber to England. Three-fourths of the India export was credited to Great Britain and one-fourth to the

United States. The Assam rubber came chiefly from Calcutta. Borneo was another small source; as were also Rangoon, Penang, and Java. Sumatra and Malacca were said to not contribute to the English supply.

The accompanying extracts from English papers of recent date indicate an active interest in the question of the rubber supply.

[London Times, November 5, 1890.]

THE NEW WEST AFRICAN EXPEDITION.

The expedition to Lagos under Mr. James Bennett, with Commander Cameron as his chief staff, will leave England in the yacht *Fawn* on Saturday or Monday next. The party will consist of twenty-four all told, and it is computed that they will be absent six months. The following official notice regarding the expedition has been issued from the colonial office:—

"Notice is given hereby that the colony will shortly be visited by Mr. James Bennett, of London, charged by the right honorable the Secretary of State for the colonies with the duty of inquiring into and reporting upon the mineral and vegetable resources of the colony with a view to their further development. Mr. Bennett, besides being a gentleman of large experience both as a consulting mining engineer and in commerce, is the inventor of a special process for extracting, by means of chemicals, pure rubber from the milk of the wild fig tree, of which several species are to be found in the colony, and it is hoped that great advantage will accrue to the colony and adjoining territories from his visit. He will devote particular attention to those articles, such as rubber, gums, fibers, and minerals, in which it is thought that the present trade of the colony may be largely increased, or which are considered apt to become subjects of local manufacture. His excellency the governor trusts that the people of the colony, and especially the important commercial body, will place their valuable local knowledge at Mr. Bennett's disposal, and otherwise render him every assistance calculated to make his visit prove useful to the colony.

By command:

OLIVER SMITH,
Acting Colonial Secretary.

The COLONIAL SECRETARY'S OFFICES,
Lagos, March 28, 1890.

Mr. Bennett will visit various other places on the coast, and has received the following letter from the colonial office:

DOWNING STREET, *October 25, 1890.*

"SIR: In reply to your letter of 20th instant, I am directed by Lord Knutsford to acquaint you that he will be glad to instruct the governors of the various West African colonies which you propose to visit to afford you every facility and all the information and assistance in their power. As, however, there has not been time to communicate with them in advance, his lordship is unable to make any pecuniary arrangement such as has been sanctioned in the case of Lagos. I am to add that Lord Knutsford has no objection to your undertaking any commission you may think proper for the development of trade. I am to state that the Oil rivers are not under the control of this department, but of the Foreign Office.

"I am, sir, your obedient servant,

"JOHN BRAMSTON."

[Leeds Mercury, November 11, 1890.]

The new expedition to Africa by Mr. James Bennett and Commander Cameron is for the purpose of finding out the possibilities of fresh trade on the West Coast, up the Gambia, the Oil, and other rivers. There are many materials of value not yet

exchanged by the natives with the traders, and india rubber is to have special attention, Mr. Bennett having a process by which the crude material can be so purified as to go at once into the hands of the manufacturer. It is not proposed to trade on this trip, but simply to ascertain what trade may be done. Two or three English ships leave the West Coast every week at present with cargoes valued at from £200,000 to £300,000, and there is thus a fine opening for enterprise. With palm oil at £40 per ton and India rubber at from £200 to £500 per ton, Commander Cameron may well say that "the old Spanish galleons are not to be compared with the vessels of to-day." The expedition goes out in a small steamer of 45 tons register.

[Yorkshire Post, November 15, 1890.]

MR. BENNETT'S EXPEDITION TO WEST AFRICA—WITHDRAWAL OF OFFICIAL SUPPORT.

With reference to the statement regarding the proposed expedition to West Africa, it is announced that the colonial office, finding that the objects of Mr. Bennett's expedition are not of a merely scientific character, as had been supposed, has withdrawn the introductions to the governors of the Gambia, Sierra Leone, and Gold Coast colonies; and that Commander Lovett Cameron has informed Mr. Bennett that he has severed himself from the expedition, and holds Mr. Bennett responsible for all loss and damage. Commander Cameron's interview with Lord Knutsford on Wednesday was for the purpose of explaining that his connection with Mr. Bennett has been terminated. Mr. Bennett never received a direct appointment from the colonial office, although the governor of Lagos was authorized to arrange for his visit to that colony. All this quasi-official support, however, has now been withdrawn.

[Yorkshire Evening Post, November 15, 1890.]

The withdrawal of official support from the proposed expedition of the *Faun* to the West Coast of Africa is generally regarded as an indirect consequence of the revelations of the week upon African exploration. The colonial office, on the ground that it finds the objects of Mr. Bennett's expedition to be not merely of a scientific character, has taken back the introductions to the governors of the Gambia, Sierra Leone, and Gold Coast colonies, and pressure has been brought to bear, it seems, upon Commander Lovell Cameron to sever himself from the expedition.

F. H. WIGFALL,
Consul.

UNITED STATES CONSULATE,
Leeds, November 17, 1890.

LEITH.

REPORT BY CONSUL BRUCE.

THE MANUFACTURES OF INDIA RUBBER.

As to the manufacture of rubber goods the output of this district will be about $2,500,000, the leading article of the same being rubber shoes and boots. Next to boots and shoes are goods for mechanical purposes, to wit, hose, belting, etc. Third on the list of manufactured goods are clothing, viz, waterproofs, gossamers, etc. These goods are exported all over the world, except to the United States and Russia. Australia and New Zealand are the largest consumers—after these India and South America.

The North British Rubber Company, limited, in this city, is the largest in Great Britain, and the price lists of same are inclosed herein.

The rubber used in Great Britain is imported free of duty.

There are scarcely any manufactured rubber goods imported in this consular district. I am informed that France and Germany compete for some of the trade in Great Britain, and sell about $500,000 worth of rubber shoes annually. Three or four years ago the competition was strong. Now there is an understanding between the manufacturers in Great Britain and on the continent so that cutting in prices has generally stopped. The manufacturers of the three nations meet yearly and arrange the prices satisfactorily among themselves.

There are practically no rubber goods sent from the United States to this district or in fact to Great Britain. I am informed that whatever goods are sent are for the most part sent to London, presumably for resident Americans.

There are no duties imposed on foreign manufactures of rubber in this country.

I am informed that American goods are regarded here as inferior in quality or durability. This, however, is not my own experience, nor the judgment of American travelers who have tested both British and American manufactures, and it is conceded by the manufacturers here that for the art of manufacture American rubber goods are equal to any in the market.

I might add that the North British Rubber Company, Limited, has a capital stock of $1,750,000. The Scottish Vulcanite Company, also of Edinburg, is the largest manufactory of hard-rubber goods in Great Britain, and is stocked for $875,000, many of the shareholders being the same as those of the North British Company. The Vulcanite Company manufactures largely for the home trade of Great Britain, but sells some goods in France, Germany, and Canada. Their trade with the United States is limited.

It would require, in my judgment, much energy and considerable expense on the part of American manufacturers or dealers to obtain a profitable trade in this country. It would call for first-class agents to introduce the goods. Conservative people take slowly to anything new, or to goods in any way differing from what they are accustomed to wear. I might add that rubber overshoes are rarely worn in this country. It is not often that one sees a rubber overshoe even in wet weather. Ladies and gentlemen wear, for the most part, clumsier and heavier shoes than we do either in New York or in the Sierra Nevadas. Waterproofs, or "mackintoshes," are worn here perhaps more than in the United States. One would think that there was an opening in the large cities of Great Britain for a first-class American shoe store, where newer patterns of shoes, more graceful and better made than those here obtainable, could be had; and such an establishment, if successful, might introduce rubber goods which are made in America.

WALLACE BRUCE.

UNITED STATES CONSULATE FOR LEITH, *Consul.*

Edinburgh, November 3, 1890.

LIVERPOOL.

REPORT BY CONSUL SHERMAN.

The only rubber manufactory in Liverpool is the Liverpool Rubber Company, Limited. The articles manufactured by this company are garden hose, boots and shoes, sheet tubing, and cord rubber, and other sundry articles for mechanical purposes. Rubber clothing is not manufactured in this district. The output of the Liverpool Rubber Company is about 3,000 to 4,000 pairs of boots and shoes per day.

There are no reliable statistics from which could be quoted the export of the several articles of rubber manufactures from this district, but I learn that the articles manufactured by the Liverpool Rubber Company are exported to all countries not tropical. The board of trade returns show that the value of caoutchouc manufactures (the produce of the United Kingdom) exported from this country during the year 1889 amounted to £1,125.55 ($5,470,197). The value and the countries to which exported are as follows:

Countries.	Value.	Equivalent in U. S. currency.	Countries.	Value.	Equivalent in U. S. currency.
Russia	£16, 298	$79, 313	Italy	£15, 803	$76, 904
Sweden and Norway	32, 580	158, 550	Austrian territories	6, 439	31, 334
Denmark	12, 232	59, 526	Turkey	14, 960	72, 801
Germany	179, 857	875, 273	Japan	11, 997	58, 383
Holland	76, 124	370, 456	United States of America	56, 284	273. 905
Belgium	121, 231	589. 970	Mexico	25, 453	123, 866
France	201, 692	981, 241	United States of Colombia	6, 551	31, 817
Portugal, Madeira	5, 556	27, 022	Other countries	118, 567	576, 235
Spain and Canaries	17, 022	82, 837	British Possessions	206, 972	1, 005, 883

In addition there were exported from this country foreign manufactures of caoutchouc amounting to £27,077 ($131,769).

The discounts vary according to circumstances. Price lists of manufacturers of rubber goods who have agencies in this city are also annexed.

All of the crude rubber used here is imported, and admitted duty free.

So far as can be ascertained, there are no rubber manufactures imported into Liverpool. These articles are imported into London from the United States, France, Germany, Holland, and Belgium, and through agencies there forwarded to the provinces for sale.

The value of caoutchouc manufactures imported into Great Britain during the year 1889 was £318,439 ($1,549,683), weighing 3,132,976 pounds. The value and the countries from which imported are as follows:

Countries.	Value.	Equivalent in U. S. currency.	Countries.	Value.	Equivalent in U. S. currency.
Germany	£165, 135	$803, 628	France	58, 567	285, 016
Holland	27, 381	133, 249	United States of America	50, 397	245, 253
Belgium	15, 326	74, 583	Other foreign countries	1, 483	729

The value of caoutchouc imported into Great Britain during the same period was £2,617,369 ($12,720,413), and weighed 236,310 hundredweights.

The import of caoutchouc into Liverpool during 1889 was 188,806 hundredweights.

Manufactures of rubber imported into this country are admitted duty free.

The only articles of American manufacture sold in this district are boots and shoes. These compare most favorably with those of the Liverpool Rubber Company, those manufactured in other parts of the country, and those imported on account of their being slightly cheaper and of better finish. In addition to these advantages, the American manufactured boots are preferred on account of their being more durable and not so liable to crack.

With the advantages that American boots and shoes have over those imported or manufactured here, it is believed that a much greater sale would follow their being placed more prominently before the public.

It is well to note here that rubber overshoes are worn only to a very limited extent.

THOS. H. SHERMAN,
Consul.

UNITED STATES CONSULATE,
Liverpool, December 24, 1891.

GLASGOW.

REPORT BY CONSUL BROWN.

I find that almost every kind of goods of which rubber forms the whole or a constituent part is manufactured in this district, boots and shoes being the only notable exception. There are no less than five extensive manufactories of rubber goods situate in Glasgow and its immediate vicinity, only two of which, however, manufacture from the crude rubber. If any classes or lines of goods manufactured here might be considered specialties, it would be waterproof clothing, which is manufactured in great variety and in large quanties. Next to this class of goods, rubber belting, hose, tubing, etc., is manufactured most extensively. These goods are exported to Spain, Portugal, and the northern countries of Europe, in limited quantities, and largely to Australia and other British colonies throughout the world.

A very little is exported to the United States, the total value for the last six months being but $5,000, and consisted solely of waterproof clothing and waterproof piece goods, and a single small consignment of rubber overshoes.

I am informed that there is scarcely any importation of the manufactures of rubber, except from the United States, and the amount im-

ported from the United States is not large. The actual amount imported from the United States for six months ending December 1, 1890, was 1,753 cases (and packages of all kinds), weighing 72,730 pounds, and of the value of $32,560. I understand a portion of this amount was rubber in barrels, for remanufacture, but much the largest item of the above consisted of boots and shoes. I have heard but a single criticism upon American rubber goods, but I imagine I might have heard the same criticism repeated had I made further inquiry, and that was that American rubber goods are not heavy and durable enough, though it is admitted that the quality, for the weight, is satisfactory. The only suggestion that can be offered in relation to question nineteen is, if American rubber manufacturers are desirous of extending their trade in this direction, they must not only produce good goods (which I believe they are now doing), but undersell the home manufacturer.

L. W. BROWN,
Consul.

UNITED STATES CONSULATE,
Glasgow, December 18, 1890.

LONDON.

REPORT BY CONSUL-GENERAL NEW.

Manufactures.—London is one of the chief, if not the chief, centers of India-rubber manufacture. There are a large number of manufactories in and around London where India-rubber goods of all kinds are manufactured, the principal of which are India-rubber clothing, balls, and balloons, belting, India-rubber canvas shoes, door springs, floor cloth, hose, machine belting, mats, overshoes, bicycle tires, stamps, and steam packing.

Exports.—The countries to which manufactures of India rubber are exported are as follows (the values are for 1889):

Countries.	Value.	Countries.	Value.
Russia	$81,490	Chile	$67,710
Sweden and Norway	162,900	Brazil	181,425
Denmark	61,165	Argentine Republic	186,075
Germany	899,280	Other foreign countries	157,625
Holland	380,620		
Belgium	606,155	Total	4,592,915
France	1,008,160	British Possessions in—	
Portugal	27,765	South Africa	74,805
Spain	85,110	East Indies	229,670
Italy	79,015	Australasia	569,770
Austria	32,195	North America	107,745
Turkey	74,800	West Indies	25,435
Japan	59,985	Other British Possessions	27,435
United States of America	281,420		
Mexico	127,265	Grand total	5,627,775
United States of Colombia	32,755		

Duties.—There is no duty on raw rubber or on the manufactured goods in this country.

IMPORTS.

Caoutchouc.—The following table gives the quantity and value of caoutchouc imported into this country in 1889, and the countries whence imported:

Countries.	Quantity.	Value.	Countries.	Quantity.	Value.
	Cwt.			*Cwt.*	
Germany	7,422	$24?,230	Other foreign countries	1,411	$35,440
Holland	2,568	101,230			
Belgium	1,257	53,875	Total foreign countries	196,799	11,500,175
France	6,674	170,365			
Portugal	9,176	487,245	British Possessions in—		
West Africa	26,655	918,135	West Africa	13,545	527,130
East Africa	3,962	180,620	Gold Coast	5,760	204,530
Madagascar	3,709	183,050	South Africa	495	18,405
United States of America	9,927	254,060	Aden	4,425	197,870
Central America	205	11,255	East Indies	14,908	625,475
United States of Colombia	879	57,590	Other British Possessions	288	13,260
Ecuador	295	19,910			
Brazil	122,649	8,777,590	Grand total	236,310	13,086,845

Manufactured goods.—The quantity and value of manufactured rubber goods imported into the United Kingdom from foreign countries in 1889 were as follows:

Countries.	Quantity.	Value.
	Pounds.	
Germany	1,943,997	$825,675
Holland	182,246	136,905
Belgium	86,416	76,630
France	482,767	292,835
United States of America	416,388	251,985
Other foreign countries	20,062	7,415
Total	3,131,876	1,591,445
British Possessions	1,100	750
Grand total	3,132,976	1,592,195

AMERICAN RUBBER GOODS.

Imports.—The amount of rubber manufactures imported from the United States in 1889 was 416,388 pounds of the value of $251,985. In 1888 the amount was 374,410 pounds of the value of $204,950. It is not possible to give the separate items.

Quality.—It is considered in the trade that American waterproofs and rubber shoes are capable of holding their own against all but the very highest priced of those articles made in this country.

How to increase trade.—The only way I can suggest to American rubber manufacturers to extend their business is to appoint agents here to show their goods. There are already one or two American firms who have agents established in London.

JOHN C. NEW,
Consul-General.

UNITED STATES CONSULATE-GENERAL,
London, November 29, 1890.

MANCHESTER.

REPORT BY CONSUL FOLSOM.

In this consular district there are but few (if any) rubber goods imported directly from the United States, purchases being made in London and elsewhere. There are no duties imposed upon foreign manufactures of India rubber. The greater part of American rubber goods seen here are not considered superior to those of English manufacture. The only suggestion that can be offered to manufacturers desiring to extend their trade into this district is that they should be able to supply the purchaser with superior goods at equal or lower rates than those of English or foreign manufacture.

BENJAMIN FOLSOM,
Consul.

UNITED STATES CONSULATE,
Sheffield, December 8, 1890.

CONTINENT OF AMERICA.

DOMINION OF CANADA.

FORT ERIE.

REPORT BY CONSUL BEDELL.

India rubber is not manufactured in this district. Occasionally boots, shoes, clothing, belting, etc., are imported from Buffalo, amount not to exceed $500 per annum, on which there is a duty of 25 to 30 per cent ad valorem. No crude is imported. Nothing can be done for American manufacturers, as the duty practically prohibits the sale of American goods here, excepting where better goods are required than those manufactured in this country.

OSSIAN BEDELL,
Consul.

UNITED STATES CONSULATE,
Fort Erie, October 18, 1890.

GASPÉ BASIN.

REPORT BY CONSUL DICKSON.

There are no rubber goods of any kind manufactured in this district, nor are there any rubber goods to speak of imported into this district from the United States direct, although about one-half of the rubber goods sold here are of American make; the merchants procure them through jobbing houses at Montreal and Quebec.

American rubber goods are regarded here far superior to Canadian, and sell for one-third more. Rubber boots and shoes are the main kinds of rubber goods used here, and they are used to a large extent.

The duties on rubber goods in the Dominion of Canada are 25 per cent.

In regard to the last question, contained in this circular, my suggestion to the rubber manufacturers would be to send their price lists to this Consulate, and I will cheerfully give them to the large dealers.

ALMAR F. DICKSON,
Consul.

UNITED STATES CONSULATE,
Gaspé Basin, Quebec, November 15, 1890.

GUELPH.

REPORT BY CONSUL HUNT.

Crude rubber may be entered free of duty, as may rubber substitute. There is, however, a tariff of 35 per cent on clothing and 25 per cent on shoes, etc. Probably not over $5,000 to $7,000 worth of foot gear is sold in the entire district. It is estimated that the consumption of other rubber goods will not be much in excess of $18,000, nearly all of which is of English importation, excepting perhaps the common black heavy rubber coats, which are generally imported from the United States.

LOTON S. HUNT,
Consul.

UNITED STATES CONSULATE,
Guelph, October 31, 1890.

Kingston.—There is no manufacture of India rubber in this consular district. Rubber shoes, boots, and over garments are in general use; nearly all are manufactures of Canada; a small quantity is imported from the United States to supply fastidious customers, as it is claimed, doubtless with truth, that the American rubber looks neater and is better finished than that of Canadian make. Crude or raw rubber is free; manufactures of rubber pay a duty of 25 per cent ad valorem. (M. H. Twitchell, Consul, Kingston, October 13, 1890.)

London, Ontario.—Questions 11, 12, and 13: No.

Question 14: Crude India rubber is admitted to Canada free of duty.

Questions 15 and 16: None.

Question 17: From 10 to 25 per cent.

Question 18: The bulk of rubber goods used being of Canadian manufacture there admits of no comparison.

Question 19: I am afraid the American article would have little or no sale, having to pay above duty.—(H. Z. Leonard, Commercial agent, London, Ontario, October 14, 1890.)

NOVA SCOTIA.

REPORT BY CONSUL-GENERAL FRYE, OF HALIFAX.

No rubber goods are manufactured in Nova Scotia nor in any of the maritime provinces. They are manufactured in another part of Canada, and many of them are sold in this province; but I am unable to state the quantity, for comparison with the goods imported.

The imports of rubber manufactures at the port of Halifax are said to embrace much the larger portion of all such goods imported into the province. For the year ending June 30 last the total value of

the same was $31,233. The value of those imported from the United States was $13,737, from Great Britain $17,344, the small remainder being from Germany.

The following statement from the records of the custom-house specifies the kind of goods and value from each country for the year mentioned:

Name of article.	Great Britain.	United States.	Germany.	Total.
Boots and shoes	.....	$3,219	.....	$3,219
Belting	$23	3,348	.....	3,371
Clothing	15,015	2,144	.....	17,159
Hose	15	698	.....	713
Racking and matting	307	1,539	.....	1,846
Rubber, not elsewhere specified	1,984	2,784	$142	4,715
Total	17,344	13,737	142	31,223

From this statement it appears that all the imported boots and shoes, practically all the belting and hose, over 80 per cent of the packing and matting, and nearly 60 per cent of articles not elsewhere specified are from the United States. Of rubber clothing only 12½ per cent is from the United States, all the rest being of English manufacture.

Dealers in rubber goods inform me that American rubber boots are superior to those of Canadian manufacture, and are more salable. The larger part used, but not all, is from the United States. American rubber shoes for ladies' wear are also of finer and better quality than the Canadian, and sell for a little more. But of the ordinary quality of shoes the larger part is manufactured in Canada.

The Canadian tariff on manufactures of rubber is as follows:

India-rubber boots and shoes with tops or uppers of cloth or of material other than rubber, 35 per cent ad valorem.

India-rubber boots and shoes, and other manufactures of India rubber not elsewhere specified, 25 per cent.

India-rubber clothing, or clothing made waterproof with India rubber, not elsewhere specified, 35 per cent.

Rubber belting, hose, packing, mats and matting, and cotton or linen hose lined with rubber, 5 cents per pound, and 15 per cent.

India-rubber vulcanized handles for knives and forks, 10 per cent.

It may not be possible to make any suggestions beneficial to the American manufacturers desirous of extending their trade into the maritime provinces. In view of the Canadian tariff it is necessary that imported goods should excel in quality those of domestic manufacture, and the reputation of such imported goods, once established, should be maintained. Further, too large profits should not be expected where the Canadian manufacturer is protected by the tariff. In this way, with no increase in the Canadian rate duty, I believe energetic American manufacturers may hold their trade and extend it more or less in the maritime provinces.

WAKEFIELD G. FRYE,
Consul-General.

UNITED STATES CONSULATE-GENERAL,
Halifax, November 5, 1890.

PORT SARNIA.

REPORT BY CONSUL PACE.

Rubber goods, such as belting, packing, boots and shoes, rubber clothing, and rubber hose, are sold here to some extent, and the dealers here purchase their stock principally in Montreal.

The firms engaged in the sale of rubber goods in Port Sarnia may be enumerated as follows: Six boot and shoe firms whose sales are confined to rubber boots and shoes, sell $21,000 of these goods each year.

Four hardware dealers are engaged in selling belting, hose, and packing; they estimate their sales to be $10,000 yearly. The dry-goods dealers, druggists, and fancy-goods establishments report their aggregate sales at $11,000, making a total of $42,000 as the value of rubber goods sold at Port Sarnia during the year ending June 30, 1890.

Of the total amount of rubber goods consumed at this port it is estimated that 20 per cent of these goods were purchased in the markets of the United States, the balance or 80 per cent of the whole amount is purchased direct from the manufacturer at Montreal.

The rate of duty on rubber goods imported into this country from foreign countries, including England, is as follows:

On rubber boots and shoes, composed entirely of rubber, 25 per cent ad valorem; on shoes composed in part of cloth with rubber bottoms, 35 per cent. On heavy rubber clothing with rubber surface 10 cents per pound and 25 per cent ad valorem; on vulcanized rubber not wholly manufactured, 10 per cent on finished articles composed of vulcanized rubber, 35 per cent.

The percentage of rubber goods imported from the United States is principally confined to the better qualities of rubber boots and shoes, and fancy articles composed wholly or in part of vulcanized rubber.

The high rate of duty imposed upon articles manufactured from rubber seeking a market in Canada, which resulted from the so-called national policy of Sir John A. McDonald, has had the tendency to stimulate the manufacture of rubber in Canada, and during the last ten years competition in trade here has cheapened these articles to the Canadian consumer fully 50 per cent.

SAM'L D. PACE,
Consul.

UNITED STATES CONSULATE,
Port Sarnia, October 31, 1890.

PRINCE EDWARD ISLAND.

REPORT BY CONSUL HALL, OF CHARLOTTETOWN.

India rubber is not manufactured in this province.

This is a wet, cold country, and the demand for rubber boots and shoes is large per capita. Dealers draw their supplies from the prov-

inces of Ontario and Quebec. Some say the quality is as good as American; others say the American is the best.

I. C. HALL,
Consul.

UNITED STATES CONSULATE,
Charlottetown, Prince Edward Island, November 1, 1890.

Statement showing the value of India rubber goods imported into Prince Edward Island, year ending June 30, 1890.

	Value.	Duties.		Duties collected.
		Specific (per pound).	Ad valorem.	
		Cents.	*Per cent.*	
Boots and shoes from United States	$2,098	.....	25	$524.50
Belting, 1,421 pounds, United States	279	5	15	112.90
Waterproof clothing, United States	1,266	.....	35	443.10
Waterproof clothing, Great Britain	1,589	.....	35	558.25
Hose, 218 pounds, Great Britain	102	5	15	26.05
Hose, 619 pounds, United States	205	5	15	61.70
Other manufactures of rubber from Great Britain	420	.....	25	108.00
Other manufactures of rubber from United States	181	.....	25	45.25
Packing, mats, and matting from Great Britain, 52 pounds	23	5	.....	6.05
Packing, mats, and matting from United States, 13 pounds	10	.....	.....	2.15
Total	6,173	.....	.....	1,884.95

QUEBEC.

REPORT BY CONSUL RYDER.

Crude rubber has not been imported into this district since 1874, at which time the industry located in this city for the manufacture of rubber boots and shoes was removed to Montreal, notwithstanding the great effort being put forth to retain the plant here. The supply of crude rubber arriving at the port of Quebec for ten years previous to that date amounted to the gross sum of $501,094, of which $396,533 was imported from the United States, $103,515 from Great Britain, $991 from France, $49 from Germany, and $6 from Norway. All of this raw material was consumed in the manufacture of boots and shoes at this port.

Since 1874 the entire importations of rubber have consisted of clothing, belting, and hose. The returns show a marked falling off in importations from the United States. For instance, in three years' imports (1885, 1886, 1887), rubber goods amounting to $48,257 were entered at this port, of which $35,279 came from Great Britain and $12,112 from the United States. In 1888 $21,145 worth were imported, $15,520 from Great Britain and $5,384 from the United States. For 1889 imports amounting to $29,773 were received, $22,320 from Great Britain and $7,028 from the United States.

These figures are significant, showing that while nearly four times the quantity of crude rubber came from the United States, Great Britain

exports to the Dominion four times the quantity of manufactured rubber which is exported from the United States. Rubber clothing is admitted at a duty of 35 per cent; hose, belting, mats, etc., at 5 cents per pound and 15 per cent; crude rubber, free.

In speaking with a dealer in rubber clothing on the subject, he said:

English goods are sold at retail about 20 per cent less, which accounts for the increased importations from that country. American goods are preferred by the better class of customers, as they are more stylish in cut, are finished in a more workmanlike manner, and more comfortable to the wearer; but they are more expensive.

The reason that English goods are cheaper is because labor in that country is so much poorer paid than in the United States. When American manufacturers can, by the use of improved methods and machinery in lieu of cheap labor, furnish rubber goods as cheaply as Great Britain, they can monopolize the trade in this market.

FREDERICK M. RYDER,
Consul.

UNITED STATES CONSULATE,
Quebec, November 20, 1890.

STRATFORD.

REPORT BY CONSUL HOLLOWAY.

Imports of rubber goods for quarter ending September 30, 1890, $3,479, principally American goods, as follows: American boots and shoes, with uppers, $1,618; without uppers, $1,819; English clothing, $42.

American rubber boots and shoes are considered the best in the market, as is also English rubber clothing.

The reduction of the price, so that American goods can be retailed at the same price as Canadian manufactured goods, is the best way to increase American trade.

W. J. HOLLOWAY,
Consul.

UNITED STATES CONSULATE,
Stratford, October 15, 1890.

TORONTO.

REPORT BY CONSUL POPE.

There is a manufactory in the city of Toronto where large quantities of India-rubber goods are made, consisting of clothing, hose, belting, and mechanical appliances. Boots and shoes are not made here. This is the only factory of the kind in the province of Ontario.

The factory turns out about 30,000 articles of clothing in a year and the general output for all classes of goods is about 50,000 pounds per month.

There is no export trade whatever to foreign ports.

The crude rubber is imported free of duty.

The following figures will show the extent of foreign importations for the year ended September 30, 1890, as for goods cleared in Toronto custom-house:

	Boots and shoes.	Clothing.	Miscellaneous.
United States	$45,134	$6,415	$36,970
Great Britain	.....	73,072	.....
Other countries	.....	.....	32,291

The exportations from the United States as per above figures show that there were $45,134 worth of boots and shoes imported in 1890, $6,415 worth of clothing, and $36,970 worth of miscellaneous goods.

The following figures will show the Canadian tariff for imported rubber goods:

India-rubber vulcanized handles for knives and forks, 10 per cent.
India-rubber clothing, or clothing made waterproof with rubber, 35 per cent.
India-rubber hose, belting, packing, mats, and matting, 5 cents per pound and 15 per cent.
India rubber, manufactures of, not elsewhere specified, 25 per cent.
India rubber, unmanufactured, and rubber substitute and re-covered rubber, free.

The American rubber goods are considered superior to the Canadian and sell for a higher price.

There is only one suggestion which could be made for the benefit of American manufacturers desirous of extending their trade into this district, and that is to exercise great care in selecting goods for this market, as it is only by the superior quality that they can expect to compete with either Canadian or European goods.

CHARLES R. POPE,
Consul.

UNITED STATES CONSULATE,
Toronto, November 14, 1890.

WINDSOR, NOVA SCOTIA.

REPORT BY CONSUL YOUNG.

There are no India-rubber goods made in this consular district or in the province of Nova Scotia. Importations of rubber goods into this district from a foreign country are from the United States only. The value so imported during the year 1890, as furnished to me by the collector of customs at this port, was as follows:

Boots and shoes	$1,110
Clothing	130
Hose	448
Belting	376
Packing	51
Not otherwise specified	120
	2,235

I am informed by the local dealers that India-rubber shoes are chiefly obtained from Montreal, where they are manufactured, but are of inferior quality, and known to the trade as "seconds." All of the boots sold here and the better quality of shoes are made in the United States, and the higher prices are willingly paid by many customers, not only on account of the superior quality and consequent increased durability, but because they are of better shape and finish—more stylish than those of Canadian make.

American rubber goods, especially boots and shoes, are regarded as superior to those of Canadian manufacture.

A reduction of 10 per cent in the prices would, in my opinion, increase the trade in this district. American rubber shoes sell at retail from 20 to 25 per cent higher than those of Canadian make, the difference being about equivalent to the duty imposed.

Respectfully submitted.

EDWARD YOUNG,
Consul.

UNITED STATES CONSULATE,
Windsor, Nova Scotia, December 30, 1890.

WINDSOR, ONTARIO.

REPORT BY CONSUL JOSLYN.

Nearly all the rubber goods sold or used in this district are imported from the United States, except boots and shoes. The latter articles are now being manufactured in Montreal and vicinity, and are crowding out the United States productions.

The manufactures of India rubber imported from the United States at the port of Windsor from the 1st day of July, 1889, to the 30th day of June, 1890, are as follows:

Boots and shoes	$233
Belting	256
Clothing	135
Hose	379
Packing, mats, and matting	190
All other manufactures of	9,419
Total	10,612

The foregoing is the best classification that can be made. The statement does not by any means represent the amount of rubber goods used in the district. The bulk of the population of the district is along the bank of the Detroit River, and so close to the city of Detroit that clothing and boots and shoes are purchased there and put on as wearing apparel, and taken across the river without the payment of duty. Vessels also get nearly all their rubber supplies at Detroit or Port Huron.

Crude rubber and rubber in sheets, but not further manufactured, is admitted free of duty. Other than this all rubber manufactures are subject to a heavy duty.

The cost being the same, American goods are preferred to all others.

There is not enough traffic in these goods in the district to warrant any effort to extend the trade beyond its natural course.

CHAS. D. JOSLYN,
Consul.

UNITED STATES CONSULATE,
Windsor, Ontario, October 20, 1890.

MEXICO.

CHIHUAHUA.

REPORT BY CONSUL HEIMKE.

In this consular district there is no caoutchouc grown, while from the best information I have been able to obtain its cultivation as far north as Chihuahua has never been attempted. Neither are there any rubber manufactories in the district. From my observation I believe that in this country American rubber goods are given preference over those from other countries, although I am unable to obtain any reliable information as to the amount and value of rubber goods imported from the United States. The duties imposed upon foreign manufactures of rubber are as follows:

Rubber in sheets for packing machinery when accompanying machinery, free.
Rubber shoes and boots, 10 cents per kilogram.
Rubber coats, clothing, etc., for wear, $1.60 per kilogram.
Rubber for billiard-table cushions, 48 cents per kilogram.
Rubber for dental use, $2 per kilogram.

The best suggestion I can offer for the benefit of American rubber manufacturers desirous of extending their trade with Mexico is to send energetic, sober, and gentlemanly traveling agents, who speak Spanish, with a full line of samples of what they manufacture and wish to sell.

WM. HEIMKE,
Vice-Consul.

UNITED STATES CONSULATE,
Chihuahua, October 15, 1890.

NUEVO LAREDO.

REPORT BY CONSUL-GENERAL SUTTON.

CAOUTCHOUC OR INDIA RUBBER.

None is produced in this district.

While none is exported from this district, there is a considerable export from other districts in Mexico.

The exports have been as follows, values in Mexican coin:

Year ending June 30—		Year ending June 30—	
1884	$202,496	1887	$179,530
1885	66,368	1888	169,386
1886	108,488	1889	124,527

The exports for 1889 were made from ports and to countries as follows:

Ports.	Kilos.	Amount.	Ports.	Kilos.	Amount.
From—			From—		
Acapulco	910	$335	Tuxpan	16,648	$18,342
Ciudad Juarez	38	100	Vera Cruz	64,666	69,500
Frontera	3,079	2,034			
Isla del Carmen	15,475	8,067	Total	131,482	124,547
Manzanillo	1,970	645			
Mazatlan	45	30	To—		
Progreso	1,223	500	Germany	11,630	9,306
Puerto Angel	466	684	Columbia	1,170	1,085
Salina Cruz	1,170	1,085	United States	112,268	111,576
San Blas	3,577	3,841	Great Britain	6,414	2,580
Soconnsco	17,267	14,420			
Tampico	191	139		131,482	124,547
Tonala	4,757	4,675			

It will be seen that the exports for 1884 were higher than ever since; those for 1885 the lowest, and that 1889 shows a decrease of some $45,000 as compared with the previous year. While the Government has given much attention to this subject the decreased exports indicate that the supply is growing steadily less. As this supply comes from the southern portion of the country, our representatives in that section will be able to give more definite information than I can here.

MANUFACTURES OF INDIA RUBBER.

None manufactured in this district.

Imports are very small, are not stated separately, and therefore exact data can not be given.

For reasons stated above I can not give the exact data as to imports into this district. I therefore give (putting 16 and 17 together for convenience), all the data obtainable as to imports into the whole of Mexico.

Rubber coats and a cape (manga de hule) of cheap grades are imported in small quantities from the United States. Some rubber overshoes and a larger quantity of hose and belting are also imported from the United States. Elastic rubber mostly comes from Germany; shoe elastic from England, rubber erasers from Germany. The following table gives the latest data as to imports and that only from the United States, which has been published. It gives the double number (the number of the article in my translation and in the parenthesis the number in the Mexican tariff) with an abbreviated description, import duty, amount imported from the United States, and value in Mexican coin.

Nos.		Description.	Duty.	Imports.	
				Kilos.	Value.
		Belting of *leather* and *rubber*	Free	147	$58
1	(44)	Braid, etc., of cotton with India rubber, net weight, kilo	$1.60	1,149	668
21	(34)	Elastic, etc., of cotton with India rubber, gross weight, kilo	.60	1,242	1,701
24	(24)	Garters and suspenders of cotton, legal weight, kilo	.65	327	1,379
52	(67)	Elastic of linen or hemp with India rubber, G. W. K	.70	12	25
53	(59)	Garters and suspenders of linen, etc., L. W. K	.90	4	10
86	(105)	Elastic of wool and India rubber, G. W. K	.80	1,031	1,609
87	(114)	Braid, etc., of wool, with India rubber, N. W. K	2.10	.....	.....
90	(99)	Garters and suspenders of wool, L. W. K	1.30	6	18
133	(141)	Elastic of silk and rubber, or of same and mixture of cotton, linen, or wool, wide, G. W. K	1.10	360	827
134	(151)	Same as above, narrower, N. W. K	4.70	2	10
135	(152)	Elastic, etc., of silk with India rubber, narrow, N. W. K	7.00	36	127
507	(517)	Bands of rubber, coming separately, G. W. K	.10	25,090	14,862
549	(572)	Rubber cloth, suitable for making articles of dress or for any other analogous use, G. W. K	.80	2,144	1,053
550	(545)	Rubber for foot-wear, all sizes, and in strips or cords for cushions for billiard tables, G. W. K	.48	6,014	3,390
551	(544)	Rubber (India) in sheets, not attached to machinery, G. W. K	.10	35,036	11,848
552	(546)	Rubber in articles of dress, in all forms and sizes, G. W. K	1.60	3,775	5,316
553	(547)	Rubber prepared for dentists, G. W. K	2.00	62	166
573	(520)	Tubing of rubber or gutta-percha, G. W. K	1.10	20,604	13,391

This table does not show the real origin of these goods. They are imported into Mexico as from the United States, while perhaps one-half of them were European goods brought through in bond.

The very limited demand of this country is mostly supplied by American rubber goods. German, English, and French goods are generally higher priced. Farther in the interior, where it rains more and is colder, there is more sale for this class of goods. Merchants here tell me that they have very little sale, and that the goods kept over to the second season are usually melted by the excessive heat. There are high-priced overcoats of silk or cotton and rubber imported from Germany which have a small sale in the interior.

I do not think there is much of an opening for an increase in our trade in this line, except in common coats and capes and in hose and belting. New manufactories and mines are likely to take a considerable increase of the latter.

The best way to extend this trade will be to send thoroughly competent salesmen, with full line of samples, to visit the principal places of consumption. Then, if deemed profitable, one or more branch agencies should be established.

WARNER P. SUTTON,
Consul-General.

UNITED STATES CONSULATE-GENERAL,
Nuevo Laredo, Mexico, October 18, 1890.

Paso del Norte.—I am informed by commission merchants that the importations of rubber goods to this country come largely from the United States, but that there is no possible way to arrive at a knowledge of the amount received.

There are two ways in which the American trade may be extended, viz, by the aid of printer's ink and by the presence of the American

"drummer" or "commercial tourist." If he can not succeed, nothing will. I have full faith in his ability to greatly extend the rubber trade in Mexico, particularly if he can speak the Spanish language. (A. J. Sampson, consul, Paso Nel Norte, November 3, 1890.)

PIEDRAS NEGRAS.

REPORT BY CONSUL FECHÉT.

The importations of manufactures of rubber into this district is not large; importations are from United States, and none from Europe save a few suits of rubber clothing.

Merchants state that American rubber goods are preferred above all others.

Establish an agency or salesroom at chief commercial point of district, Piedras Negras preferably, where will be exhibited all lines of rubber goods from belting, clothing, boots and shoes, and rubber blankets down to a child's toy.

Two men will be needed, one as resident agent and one to travel in interior. Both should have a full knowledge of Spanish language and of Mexican trade.

This salesman need not carry a large stock; full line of samples will suffice. Located in zona libre, but 3 per cent of customs duties will have to be paid.

EUGENE O. FECHÉT,
Consul.

UNITED STATES CONSULATE,
Piedras Negras, Mexico, October 14, 1890.

SONORA.

REPORT BY CONSUL WILLARD, OF GUAYMAS.

In this consular district (Sonora, Mexico) there are no rubber trees grown for the purpose of producing rubber, either for export or other purposes. The climate is not suitable, and no experiments have been made, as I am aware of, as to the cultivation of trees, plants, or vines on this part of the Mexican coast to produce crude rubber; no crude rubber is imported and consequently there are no manufactures of rubber.

The manufactures of rubber imported are in the forms of sheet, round or square rubber for packing joints, etc., in machinery belts for machinery, hose, and a very small quantity in the shape of clothing or for foot wear (boots and shoes), and is brought exclusively from the United States; some smaller articles, such as combs, syringes, dolls, etc., are brought from Europe, but to a limited extent; the greater part of these

articles come also from the United States. In consequence of the heat of the climate and general dryness, very little rubber clothing or boots or shoes are imported. In the mines a native miner or workmen do not use, like in the United States, the manufactures of rubber in the shape of coats or boots. The amount imported through the Guaymas custom-house during the past six months was—

	Kilos.	Pounds.
Sheet or other rubber for packing machinery	1,000 =	2,200
Belting	120 =	264
Hose	40 =	88
Shoes	1 =	2¼

The manufacturers of rubber pay duty as follows:

Rubber packing	per kilogram, of 2¼ pounds..	$0.10
Rubber belting	do	.10
Rubber hose	do	.10
Rubber for dentists	do	2.00
Rubber for billiard cushions	do	.48
Rubber articles, combs, etc	do	.30
Shoes and boots	do	.48
Rubber clothing	do	1.60

Rubber belts and packing united to machinery are free of duty. Values are not given in the custom-house documents when the duties are liquidated, and I am unable to give the amount of the invoice values of the foregoing manufactures of rubber, but I think they will not exceed $3,000. The duties are paid in Mexican silver dollars.

As American rubber goods are the only ones imported into this district, there is no way of comparing them with those from other countries.

As will be seen by the foregoing, the principal use for rubber in this consular district is for belts, packing, etc., hose for machinery, combs, rubber bands for papers, and other small miscellaneous articles. As the climate of Sonora is warm and dry, there is very little use for rubber clothing or boots except to a limited extent, and suggestions as to the best manner of extending the trade in manufactures of rubber under the circumstances is somewhat difficult.

A. WILLARD,
Consul.

UNITED STATES CONSULATE,
Guaymas, November 20, 1890.

BRAZIL.

RIO DE JANEIRO.

REPORT BY CONSUL-GENERAL DOCKERY.

Neither caoutchouc nor India rubber is a product of this consular district, nor is either in its crude state handled at all in this market. There are no manufactories, and consequently no importation of the

crude materials. The industry in Brazil is carried on in the Para district only, and it is from Para that the material in its crude condition is exported. In the State of Matto Grasso, too, there are extensive forests of the rubber tree and vine, but up to the present time they are unworked. There is some talk, however, of the formation of a company here for the extraction of the gum from these forests. Their extent is not definitely known.

The importation of rubber goods is very limited. Chiefly rubber coats and boots are used here, but to a small extent. These are brought in mainly from Europe.

As to the extension of our trade in this line of goods, I can only add that the same rule applies to this as to all other cases. Our manufacturers must study the wants of these people and the needs of the market, and manufacture their goods accordingly. These people have peculiar ideas, and consequently peculiar customs, and those who manufacture goods to meet these ideas and satisfy their customs may expect to control this market. The manufacturer need not hope to revolutionize these customs and force their goods upon the people. They cling to their ideas and buy only such goods as suit them. And up to now they have always found manufacturers in England and on the continent who study their wants and meet their demands. This is the secret of their hold here, and until our manufacturer is willing to do the same he may content himself with a child's part only of this trade.

O. H. DOCKERY,
Consul-General.

UNITED STATES CONSULATE-GENERAL,
Rio de Janeiro, February 16, 1891.

CHILE.

Coquimbo.—Caoutchouc is not, as far as I know, produced on this coast south of Ecuador, and importations of American India rubber goods are very small, if any.

J. GRIERSON,
Consul.

COQUIMBO, *December 15, 1890.*

IQUIQUE.

REPORT BY CONSUL MERRIAM.

Caoutchouc, or India rubber, is not a product of this district, nor does it enter into the manufactures of the district.

From the nature of the climate, there is no market for rubber clothing, boots and shoes, etc., and I may say that there are no importations

of rubber goods, with the exception of rubber in sheets and rings for use in connection with machinery, and this is imported from England.

Neither crude rubber nor its manufacture appear on the list of articles subject to duty, nor are they on the free list. They will therefore pay such duties as the appraiser may determine.

J. W. MERRIAM,
Consul.

UNITED STATES CONSULATE,
Iquique, November 10, 1890.

URUGUAY.

REPORT BY CONSUL HILL, OF MONTEVIDEO.

Caoutchouc, or India rubber, is not a product of this district. No experiments have been made to cultivate the rubber tree and the opinion prevails that its cultivation is not practicable.

The following table shows the value of rubber goods imported during the years 1887 and 1888, these figures being the latest attainable. The amount and character of these manufactured goods can not be ascertained.

Whence.	1887.	1888.
England	$2,918	$4,259
Germany	606	865
Belgium	150	.....
Italy	64	32
Total	3,735	5,156

A uniform duty at the rate of 8 per cent ad valorem is imposed by the Government on all foreign manufactures of rubber. This is a light rate considering that the ad valorem rate on articles not specified is 31 per cent.

American rubber goods do not appear in the imports to this country. I see no reason why they should not meet with acceptance provided their introduction were pushed by intelligent and energetic agents of our manufacturers.

FRANK D. HILL,
Consul.

UNITED STATES CONSULATE,
Montevideo, December 2, 1890.

VENEZUELA.

LA GUAYRA.

REPORT BY CONSUL BIRD.

With reference to caoutchouc, or India rubber, there is little of interest to be communicated from this portion of Venezuela, since it is neither produced nor manufactured in this district. There have been two shipments of crude rubber from this port within the past nine years, but the product came primarily from the Orinoco country.

The importation of the manufactures of India rubber is so small as to be considered of little importance. There is such a paucity of manufacturing establishments of every kind in this country that very little is used for machinery, and the climate is so mild that almost none is used for clothing, boots, or shoes. The small amount imported comes generally in the form of siphons, cupping-glass rubbers, syringes, nipples, teething rings, elastic bands, shoe elastics, erasers, suspenders, garters, etc., and of hard rubber a small quantity comes in the form of pen and pencil holders, rulers, and combs.

No statistics of rubber importations can be obtained at this port, but it may be repeated that the amount is so inconsiderable as to be practically of little interest. Of the small quantity received some of the finer articles come from France, but the chief supply proceeds from the United States, and the manufactures of the latter country are esteemed as in no way inferior to those of the former.

The import duties upon rubber articles range from $6.65 to $44.39 per 101 pounds. Machinery bands, piping, tubing, and sheeting pay the former rate; siphons, syringes, cupping-glass rubbers, pen and pencil holders, erasers, and teething rings pay $11.09 per 101 pounds; combs, cloaks, shoe elastics, shoes, and manufactures not specified, pay $22.19 per 101 pounds; garters and suspenders pay $44.39 per 101 pounds.

It is difficult to offer any practical suggestions for the extension of our commerce in this class of goods. A sparse, uneducated, and poor population, a perennial summer climate, and the utter absence of manufactures are factors that preclude the idea of the expansion of the trade in rubber goods to any important extent.

WINFIELD S. BIRD,
Consul.

UNITED STATES CONSULATE,
La Guayra, December 9, 1890.

MARACAIBO.

REPORT BY CONSUL PLUMACHER.

Rubber trees.—As India rubber is not produced in this consular district, nor are rubber trees known to exist within its limits, I am unable to answer the first ten questions relating to production and export of the crude article.

Questions 11, 12, and 13, referring to manufacture of rubber, do not apply to this district, as this industry is unknown here.

Importations.—The importations of manufactured rubber amount in value to about $5,000 yearly, the United States, France, and Germany being the chief exporting countries.

The imports of rubber goods from the United States to Maracaibo amount to about $3,000, the principal articles being belting and packing for engines, syringes, hose, waterproof coats, and shoes. The trade in the two last named articles is, however, very insignificant, and does not perhaps amount in value to more than $200 in the course of the year.

Duties.—The duty on crude rubber is 28 cents per kilogram; upon belting, hose, packing for cylinders, rubber in sheets, and all preparations of rubber intended for the use of engines and machines, the import duty amounts to 17 cents per kilogram, and 56 cents upon all other manufactures of rubber. These, as are all other duties in this country, are imposed upon the gross weight, packing cases paying the same tax as the article therein contained.

American goods.—But very few articles of the same class are imported both from the United States and other countries, but when this does occur the superiority of the American goods is readily admitted, the European articles having, however, the advantage of comparative cheapness. There is no doubt that with an equality of prices American rubber goods of all descriptions would be exclusively imported.

The increase of trade.—Although the importations of rubber into this district are very insignificant, yet the supply seems to fully equal the demand, and I am told by a leading importer that this trade is not, like many others, an increasing one.

The people in this country have not yet become acquainted with the manifold uses to which rubber is put in the United States and Europe, and the articles which I have already specified are about the only ones of the class of goods which so far have been utilized here. It really appears, however, that there should be a field in this line for American enterprise, and I can offer no better suggestion, which indeed is but a repetition of former recommendations, than that American houses interested in this branch of trade send to this country competent Spanish-speaking traveling agents with good lines of samples. But little good results from circulars and correspondence. The mercantile conditions in South America are so entirely different from what we are accustomed to at home that personal experience founded upon observation and

contact with the people, is the first requisite for the successful establishment of business relations. This applies to all branches of trade and is a suggestion which has already been made scores of times, not only by myself, but by many other consular officers in Spanish America, and whenever it has been adopted I have invariably, at least in this district, noticed that the results were highly satisfactory.

E. H. PLUMACHER,
Consul.

UNITED STATES CONSULATE,
Maracaibo, November 17, 1890.

BRITISH WEST INDIES.

BERMUDA.

REPORT BY CONSUL BECKWITH, OF HAMILTON.

Crude rubber is not a product of my district; it is neither grown here nor exported from these islands.

No India rubber is manufactured in these islands and none exported from here. There are no manufacturers of India rubber here.

No crude rubber is imported here.

Manufactured goods in the shape of boots, shoes, and clothing are imported here from England and the United States. The total importations will not amount to more than $500 yearly.

Not more than $200 worth of manufactured goods comes here from the States in one year.

Duties on manufactured goods are 5 per cent ad valorem.

English goods are preferred to the American on account of lower prices. Goods are imported from no other country.

I can offer no suggestions for the benefit of American rubber manufacturers, as there is very little demand for rubber goods here and the supply is always equal to the demand.

HENRY W. BECKWITH,
Consul.

UNITED STATES CONSULATE,
Hamilton, November 13, 1890.

LEEWARD ISLANDS.

REPORT BY CONSUL BRADFORD, OF ANTIGUA.

The caoutchouc tree is not and never has been grown in these islands as an article of commerce; nevertheless, they are well adapted to its culture, the tree, when planted simply as an ornament or curiosity, growing with unexampled rapidity and thrift, and attaining a large

size. There is a very large one in the gardens of Government House, Antigua; and one, planted only ten months ago by one of the prominent merchants of St. Johns, has already attained a height of 18 feet.

Of the Leeward Islands I should not hesitate to say that Dominica and Antigua offer the best facilities for the growth of the rubber, either as a tree or vine. As will be seen by the subjoined table, there is a large acreage unoccupied in Antigua, and a very much larger area in Dominica. Of this latter island, I am informed by people of repute that it is even more suitable for the growth of the caoutchouc tree or vine than even Antigua. Nearly all of the uncultivated area can be utilized; and I am assured that the cost of the land would be so small as not to enter into the question of planting at all.

St. Christophers, or "St. Kitts" as it is commonly called, is not available for the rubber industry, as it is nearly all under cultivation, mostly with sugar; but, as will be seen by the table, there are large areas in the other isles.

Since the receipt of the Department's circular, I have talked much with merchants and planters in this island; find them anxious to engage in the enterprise. I think I have seen and heard enough to justify me in saying that it would be worth the trouble and expense to any American company which should wish to send an agent to these islands to examine for himself. I would be happy to aid him in his investigations to the utmost of my ability.

There are no imports of either crude or manufactured rubber into these islands, with the exception of a few rubber coats for individual use and what are called "Plimsolls," a patent rubber sole for boots and shoes. These come from England and pay no duty. On goods of this character imported from foreign countries there is a specific duty of 6 per cent ad valorem. There is no export duty.

I may add that I have been petitioned by many planters and merchants to ask for a small supply of seed with which to experiment in this island, the project most in favor being to plant the trees in rows and what is here called "fiber" (out of which manilla cordage is manufactured) between the rows.

Statement showing total areas and areas of uncultivated lands in the consulate of Antigua.

No.	Name.	Areas.		Remarks.
		Total.	Uncultivated.	
		Sq. miles.	*Acres.*	
1	Antigua	170	46,099	Mostly available.
2	Anguilla	35	(*)	About three-fourths available.
3	Dominica	291	166,000	Mostly available.
4	Montserrat	47	20,000	Do.
5	Nevis	50	20,000	About one-half available.

* Nearly all.

JNO. S. BRADFORD,
Consul at Antigua.

UNITED STATES CONSULATE,
Antigua, November 7, 1890.

TRINIDAD.

REPORT BY CONSUL PIERCE.

In this consular district there are no manufactures of India rubber, and the importations of articles of that manufacture are very small, and limited principally to mats, shoes, blankets, overcloaks, and water hose. I find it impracticable to arrive at the relative amount of such articles imported from the United States and other countries for the reason that they and various other manufactured goods are entered at the custom-house under the general term of "Goods manufactured unenumerated" which pay an ad valorem duty of 4 per cent. It is believed, however, that American importations are reasonably large and so far as I have ascertained give full satisfaction. Messrs. C. L. Haley & Co., and Messrs. Todd & Sons probably deal more largely in rubber goods than the other houses here, and I would suggest that our rubber manufacturers and dealers correspond with them in respect to details.

The caoutchouc or India rubber tree is not native to this consular district, but it has been more or less experimented with of late years, though as yet no efforts to systematically plant, beyond experimenting, have been engaged in. I have been favored in this connection with a letter from Mr. Henry W. C. Dehm, who is connected with the "Rose Hill" Nurseries of Messrs. Siebrecht and Wadley, of New Rochelle, N. Y., and is extensively engaged in the culture of tropical plants here—island of Trinidad—in which he states:

Ficus elastica, the white rubber, can be grown here in open districts to medium advantage, but do not think the productive power is sufficient to pay a proper dividend for the investment inside of ten years, and even then it is questionable, because they do not grow fast enough.

The Caoutchouc or Castilloa elastica.—This tree will pay to raise in large quantities, but it must be grown under shade. Its producing power after five years, I think, will pay a dividend of 25 per cent on investment. It grows freely and to a good size, and nearly one-third of the island would be conducive to its growth. It will also do well in Tobago. As to the other rubber-producing trees on this island they have no commercial value, as their producing power is so small it would not pay to extract the same.

The following appears in the annual report on the Royal Botanic Gardens of this colony for 1889:

Central American rubber (castilloa elastica, Cav).—Our trees of this still continue to thrive, and have produced seed in fairly large quantities. Numerous plants have been raised, and the demand for these has been full and constant during the past year.

This is undoubtedly a tree suitable for cultivation, as it yields rubber freely all the year round. It is probably one of the most valuable of our rubber-producing plants. It is, however, with us not a tree that can be planted in the open, as is shown by the numerous specimens growing here. Those exposed to the sun are in the dry season stunted and dwarfed, while those growing under shade are, on the other hand, in a flourishing state; and this feature of growth is also maintained in the various positions in which it has been recently planted in Trinidad and Tobago.

East India rubber (Ficus elastica).—This is a much more hardy plant with us than that previously mentioned. It grows to a large size in the open, and can be readily propagated from cuttings. The rubber it produces is of good quality.

A tree 60 or 70 feet high, found in considerable numbers in the colony, known locally as the balata (mimusop globex, is understood to be the botanical name), produces a gum (or milk, as it is called) of some commercial value. Some years ago it was shipped to England, but the authorities, in order to preserve the forests, prohibited the sapping of these trees. The sap was obtained by making a groove down the trunk of the tree into which many small grooves in the shape of a V were made. Through these grooves the sap ran to the bottom of the tree, where it was received in vessels. On being exposed to the atmosphere it became quite consistent and was subsequently moulded into blocks of about 6 inches square. There is a large number of these trees in Manoa, Venezuela (near the disputed boundary line between Great Britain and Venezuela); also in the state of Maturin in Venezuela. More or less of this balata gum or milk has been shipped to Hamburg by Messrs. F. Urich & Son, of Port of Spain, and I would suggest that persons interested in the matter correspond with that firm as to details. The wood of the "balata" is very hard and highly useful for wood work. The gum is considered of less importance, and the expense of extracting it is, proportionate to its value, very considerable.

WM. P. PIERCE,
Consul.

UNITED STATES CONSULATE,
Trinidad, November 14, 1890.

DUTCH WEST INDIES.

CURAÇOA.

Caoutchouc or India rubber is not produced here, and the few shoes of that material imported are from the United States.—(L. B. Smith, Consul, Curaçoa, November 24, 1890.)

SPANISH WEST INDIES.

CARDENAS.

REPORT BY COMMERCIAL AGENT HENRIQUES.

Rubber boots, shoes, cloaks, and hats, also toys, combs, etc., would have good acceptation here if introduced, but up to date these goods are imported into Havana and the dealers here buy from Havana firms. American manufactured rubber goods are appreciated and preferred to the European.

The only suggestion that I can fearlessly offer is for American manufacturers to send good samples and traveling salesmen and show their

goods and deal with the dealers and open up direct trade from the factory with the dealers here, as they not only pay cash, but would save enormous charges to commission houses and Havana houses; and by dealing direct they would buy cheaper and for cash, and the manufacturers would sell more.

SYDENHAM P. C. HENRIQUES,
Commercial Agent.

UNITED STATES COMMERCIAL AGENCY,
Cardenas, Cuba, October 16, 1890.

SANTIAGO DE CUBA.

REPORT BY CONSUL REIMER.

India rubber is neither produced nor manufactured in this consular district. I have made an investigation and find that several species of the ficus family of trees grow here which might be utilized, as some of them, notably the "Maboa" (Latin term not known), give a thick white juice. One disadvantage is that these trees, as nearly all other species, do not grow in groves or forests, but are scattered or mixed. No experiments have been made, and the above statement is based on personal observation.

I give you below statistics of imports of rubber goods during the current year. As all these goods pay by weight it is impossible to determine the exact quantity or quality of articles:

Imports of manufactured rubber into Santiago de Cuba during 1890.

	Kilos.
From New York—	
Rubber hose	714.680
Rubber boots	5.200
Rubber nipples and small goods	34.050
From Philadelphia (for an American mining company)—	
Rubber hose	313
Rubber packing	50
From Havre, France—	
Rubber hose	242
From Liverpool—	
Rubber boots	96
Rubber rings	.50

It is apparent by these statistics that nearly all rubber goods, such as rubber cloaks, etc., come here from Havana, where they pass the custom-house, and statistics there will be more interesting.

Merchants here prefer the French rubber hose to the American, stating that it wears better; it is sold at 25 per cent above the American manufacture. The selling prices here for American rubber hose are—

½ inch	per yard..	$0.50
¾ inch	do....	.60
1 inch	do....	.70

1 inch	per yard..	$0.80
1¼ inch	do....	.90
1½ inch	do....	1.25
2 inch	do....	1.50
2½ inch	do....	2.55
3 inch	do....	3.00

Of rubber coats, I believe, more of French manufacture are sold than American. This is no doubt owing to the fact that as these coats are only used for horseback American manufacturers have not yet sent here a coat that is adapted to the saddle. The coat must have a long cape, that will protect not alone the arms and hands, but will also protect the lower limbs from the knee up. With a coat without this cape the saddle invariably, in the heavy rains common here, gets wet. It is my opinion that business could be done, and if some enterprising rubber manufacturer sends some one here with a full line of goods appropriate to the country the trade with the United States may be considerably increased. For further information I give you below a translation of the custom-house tariff on rubber goods:

Gum elastic or caoutchouc (see drugs).

Par.		Spanish products.	Foreign products.
216	Gum elastic or caoutchouc worked into plates or belting for machinery, into hose or other analogous objects ..... per kilo..	$0.098	$0.261
217	Worked into boots, leggings, seats, life-preservers, bags, or other analogous objects ..... per kilo..	.135	0.360
218	In waterproof coats, worked over cotton textile or linen.....do....	.300	.870
219	The same over woolen fabric.....do....	.450	1.305
220	The same over silk fabric.....do....	.900	2.610
221	Gum elastic, or caoutchouc, or gutta-percha, worked into combs with wide teeth, ordinary combs, small combs, or other adornments for the head, brushes for the teeth, nails, or jewelry, penholders, and other analogous objects, even if metal, is also used, or bone, or other material.....per kilo..	.500	1.450
222	The same in catheters, syringes, small rubber erasers, nippers, syringes, and other analogous objects, on account of weight and mechanism, even if they also contain other material .....per kilo..	.800	2.320
223	Small wares, cheap rubber jewelry, bijoutry, games, and toys.....	10 per cent ad valorem.	29 per cent ad valorem.

OTTO E. REIMER,
Consul

UNITED STATES CONSULATE,
Santiago de Cuba, November 8, 1890.

CONTINENT OF ASIA.

CHINA.

Foochow.—The rubber tree is not grown in this part of China and I can not learn of any efforts having been made to cultivate it here. Rubber goods are not used by the natives and I can not learn of any being imported from the United States sufficient to be regarded as an article of commerce. There is practically no demand for said goods. Duties are not imposed upon foreign rubber goods. (Samuel L. Gracey, consul, Foochow, December 3, 1890.)

Ningpo.—There is no trade in, or demand for, rubber goods in this consular district.

A few rubber shoes are sold here, and purchased by the lower classes, although very expensive. They are made on the model of a Chinese shoe in Germany and retailed here for 69 cents, United States gold. The demand for them is very small. It would not be profitable to introduce rubber goods into the Chinese market for some years to come. (John Fowler, consul. Ningpo, 17th, December 1890.)

SHANGHAI.

REPORT BY CONSUL-GENERAL LEONARD.

Any report on this subject coming from the consular district of Shanghai must necessarily be confined to the introduction and importation of manufactures of India rubber, as caoutchouc or India rubber is not a product of this section of China, neither does India rubber enter into the manufactures of this district.

During the year ending 31st December, 1889, there was imported into Shanghai from foreign countries, India rubber valued at $10,722, rubber goods valued at $3,647. I am informed that the term "India rubber," as used above, is the designation given by the customs authorities to sheets of rubber of various thicknesses which are used in con-

nection with marine and other engines, and the term "India rubber goods," comprises a variety of manufactured rubber. In both cases there is an import duty of 5 per cent ad valorem.

I am unable to specify the country of origin of these importations, but have been told that the former comes from England, and the latter principally from the United States, as our manufactured goods are considered of superior make to that of other countries.

The only suggestion that I can make for the benefit of American manufacturers desirous of extending their trade in this district is for them, through our established merchants, to find out some use for which Chinese can employ their goods.

I am sure that our merchants have not overlooked this branch of trade, but it is possible that they have not been able to obtain from the manufacturers a cheap line of goods within the means of the Chinese masses.

Cheap rubber garments and shoes made after Chinese models of dress might take with them.

It ought also to be known that the warm damp climate that exists during several months of the year in this part of China has the tendency to soften rubber fabrics.

J. A. LEONARD,
Consul-General.

UNITED STATES CONSULATE-GENERAL,
Shanghai, December 5, 1890.

Tientsin.—The imports of India rubber goods at this port are of such small quantity that no account of them is made in the published customs reports. I have made special inquiries of the commissioner of customs, and am informed that the total imports of India rubber goods during the present year have amounted to taels 1,800 only. As the trade is so insignificant, and as there are no manufactures of India rubber goods within this consular district, I trust you will excuse me from answering categorically the questions asked in your circular. (William Bowman, consul, Tientsin, December 9, 1890.)

HONGKONG.

REPORT BY CONSUL SIMONS.

There is no production of India rubber in the consular district of Hongkong. The tree grows in the public gardens and upon the lawns of many houses, but it has never been proposed that the cultivation might be profitable from a commercial standpoint, nor does India rubber enter into the manufactures of this district or form an article of commerce.

Concerning the importations of manufactures of rubber with the countries in which they are produced, no statistics are available from which to gather the amounts from each. Letters received from merchants indicate that the bulk comes from England and Germany. While the importations from the United States are limited in quantity the goods compare favorably both in quality and price with those of other countries.

Boots, shoes, and rain coats are in most demand. Technical India-rubber goods manufactured in America are regarded with special favor, but are more expensive than those produced in England and Germany. No duty is imposed on foreign manufactures of any description.

Observations upon the best means of extending the trade of American manufactures of rubber goods implies a consideration of those by which our merchants and manufacturers in general may increase their business in this growing market to which hitherto little attention has been paid. Aside from the sending out of circulars and price lists, the first requisite is an accurate knowledge of the wants of the people and the methods after which they conduct business, to be gained, I should say, only from personal observation.

The general impression that with the high prices paid for raw material and labor our manufacturers are unable to turn out the finished article equal in every respect to that produced in other countries can only be overcome by showing samples of the goods offered. Though not so handicapped, foreign merchants have constantly on hand large supplies of goods and implements which can be seen by buyers, an advantage not to be despised.

The attempts so far by our people to enter this market have not been characterized by the energy displayed in keeping the "home market," which has perhaps become so attractive that they do not care to compete with those who act upon the broader principle—the markets of the world for home products.

The conservatism of the Chinaman, not confined to matters social and governmental and which causes him to adhere long to the economic costumes of his race after having come in contact with those of other people, marks him as a man to be calculated with in the efforts now being made to revolutionize the trade of China, not only by the introduction of articles of foreign manufacturers but the greater enterprise of entering the country with improved machinery by which these articles can be produced from her own raw materials and by her own labor, superintended by a few foreign experts.

Ignorant of many of the conditions surrounding trade with China, with a limited knowledge of the wants of the people or their methods of doing business, and only a general knowledge of what is going forward under the influence of European merchants and manufacturers, any means by which this disadvantage can be overcome will go far toward

advancing the efforts of American manufacturers desirous of extending their trade in the East.

O. H. SIMONS,
Consul.

UNITED STATES CONSULATE
Hong Kong, January 20, 1891.

JAPAN.

REPORT BY VICE-CONSUL-GENERAL SCIDMORE, OF KANAGAWA.

I have to state that India rubber is not a product of this district, and, owing to the climate, the rubber tree is not susceptible of cultivation here. No attempts, so far as I can ascertain, have been made to cultivate it.

The total imports into Japan during the year 1889, of rubber suitable for manufacturing purposes, were as follows: Raw, 689.74 yen; sheet, 21,102.80 yen; total, 21,792.54 yen.

It is impossible to enumerate the various uses to which it was put. The only rubber exported from Japan in 1889 was of foreign origin, and is reported under the head of re-exports, as follows: Sheet, 36.63 yen; ware, 252.96 yen; total, 289.59 yen.

Its destination is not stated. Crude rubber is liable to an import duty of 5 per centum ad valorem.

The imports for all Japan for 1889 were as follows:

	Yen.
Waterproof coats	3,805.86
Elastic webbings	14,803.66
India rubber:	
Raw	689.74
Sheet	21,102.80
Ware	95,719.40
Total	136,121.46
Imports from United States:	
Raw	$331.90
Sheet	248.72
Ware	6,142.14
Total	6,722.76
Great Britain:	
Waterproof coats	3,278.10
Elastic webbings	11,363.44
India rubber—	
Sheet	18,058.12
Ware	54,898.94
Total	87,598.60

	Yen.
Germany:	
Waterproof coats	498.55
Elastic webbings	2,630.18
India rubber—	
Sheet	1,059.76
Ware	14,662,00
Total	18,850.49
France:	
Waterproof coats	29.21
Elastic webbings	639.84
India rubber—	
Sheet	1,736.20
Ware	19,227.42
Total	21,632.67
Belgium	755.92
Switzerland, elastic webbings	170.20
Italy	32.98

The balance is given under head of "other countries."

Rubber and manufactures thereof are subject to an import duty of 5 per centum ad valorem.

American rubber goods are regarded favorably, but their high price militates against them in this market.

I should recommend American rubber manufacturers to correspond with the following American firms at Yokohama for fuller information, viz:

The American Trading Company, The China and Japan Trading Company, Messrs. Walsh, Hall & Company, and Messrs. Frazar & Company.

G. H. SCIDMORE,
Vice-Consul General.

UNITED STATES CONSULATE-GENERAL,
Kanagawa, January 28, 1891.

OSAKA AND HIOGO.

REPORT BY CONSUL SMITHERS.

Caoutchouc or India rubber is not a product of this consular district. So far as any information can be obtained, no experiments have been made in this district in the cultivation of rubber trees, plants, or vines. It is not believed, however, that these are susceptible of profitable cultivation anywhere in Japan.

MANUFACTURES OF INDIA RUBBER.

The imports of India-rubber goods into this consular district for 1889 were as follows:

	Amount.	Value.
	Catties.	*Yen.*
India rubber, raw	None	
India rubber, in sheet	3,698	3,971.28
India rubber ware	.....	18,841.76

The countries of the origin of the imports into this district are not specified in the customs returns, but are given for the entire country, as follows:

Countries.	Character of goods.	Amount.	Value.
		Catties.	*Yen.*
United States	India rubber, raw	284	3[illegible]1.90
	India rubber, in sheet	469	284.22
	India rubber ware	.....	6,142.14
Great Britain	....do	.....	54,898.94
	India rubber, in sheet	24,829	18,058.12
Germany	India rubber ware	.....	14,662.06
	India rubber, in sheet	852	1,059.70
France	India rubber ware	.....	19,227.42
	India rubber, sheet	2,088	1,736.20
Belgium	India rubber ware	.....	755.92
Other countries	India rubber, raw	1,598	357.84

India rubber does not enter into the manufactures of this consular district. Under the head of India-rubber ware the returns do not specify the character of the goods imported.

There is a duty of 5 per cent imposed on all imports of rubber goods.

As a means of extending trade in American rubber manufactures, I would suggest that samples be sent to the commercial museum at Osaka. This large and flourishing institution has just been opened, and contains a special department for exhibiting foreign goods. The enterprise is purely commercial, and a small fee is paid for exhibits.

E. J. SMITHERS,
Consul.

UNITED STATES CONSULATE,
Hiogo, Japan, December 2, 1890.

PALESTINE.

REPORT BY VICE-CONSUL CLARK, OF JERUSALEM.

India rubber not being a product of this country, nor of this district, the first part of the subject relating to caoutchouc, or India rubber, in its crude condition can meet with no answer from this place.

As regards the second portion of the subject, I beg to answer as follows: India rubber does not enter into the manufactures of this country.

Imported crude rubber pays, or rather would pay, 8 per cent duty.

Manufactures of rubber in the shape of waterproof cloaks, boots, shoes, belting, also surgical articles, are imported to the amount of $1,500 to $1,800 during one year, from France, England, and Germany; none from the United States.

Eight per cent duties ad valorem are imposed on foreign manufactures of rubber.

Sending price lists and samples to some responsible firm at Jerusalem or Jaffa might be expedient to introduce American rubber goods.

HERBERT CLARK,
Vice-Consul.

UNITED STATES CONSULATE,
Jerusalem, November 24, 1890.

CONTINENT OF AFRICA.

EGYPT.

REPORT BY ACTING CONSUL-GENERAL GRANT, OF CAIRO.

CAOUTCHOUC.

Caoutchouc, or India rubber, is not produced in Egypt, and there is no export trade in that article.

The following information concerning caoutchouc was communicated to me by a professor who has charge of the botanical garden in Cairo:

Up to the present time no durable experiments have been made in Egypt in the acclimatization of foreign rubber trees or plants, nor in the cultivation of indigenous rubber plants, and it is probable that the climate of Egypt proper is not favorable to the production of that article.

For the growth of the American caoutchouc plant, such as the *Liphonia*, the *Hevea*, and the *Jatropha elastica*, a uniform and somewhat damp climate is necessary. Their cultivation in Egypt would be nearly impossible on account of the periodical dryness and of the sudden changes in the temperature, and even if the plant could be kept alive it would always be sickly and would never attain the growth necessary to produce rubber. The gutta-percha tree, the *Scosandra gutta*, would fare the same way.

The *Ficus elastica*, which produces the caoutchouc in Assam, thrives well enough in that country, but its sap was found to be very poor for rubber.

Trees of central Africa yielding India rubber, a species of the genus *Landolfia*, could not thrive under the climate of Egypt; but they would grow luxuriantly in the Soudan, beyond Khartoum. It would not even be necessary to introduce new plants. It would only be necessary to develop and regulate the cultivation of *Landolfias*, which grow there spontaneously.

I transmit herewith a sample of caoutchouc produced by the *Landolfia* plant in the neighborhood of the lakes.

MANUFACTURES.

India rubber is not included in the manufactures of Egypt. There is therefore no exportation of manufactured articles of this class and no importation of crude rubber.

It has been impossible, notwithstanding repeated efforts, for me to obtain reliable information with regard to the extent of the importation of manufactures of India rubber into Egypt. It appears, however, that most rubber articles consumed in Egypt are imported from Austria,

England, France, and Germany. Such articles are subject to the usual rate of duty on imports into Egypt, namely, 8 per cent ad valorem computed on the price at the port of discharge.

The chief articles of this nature imported into Egypt are: Tubes, plates, machine packing, and articles used for chemical purposes.

The importation of rubber clothing, boots, shoes, etc., is very small. This can be accounted for in three ways:

Firstly, because there is very little wet weather. Secondly, on account of the continual heat which causes such articles to perish. On this account, also, import orders for rubber are generally very small; and thirdly, because by far the greater number of the lower class of population in Egypt go barefoot nearly all the year round.

I am informed by a dealer that most of the rubber articles imported into Egypt are of an inferior quality. I therefore see no reason why American manufactures of rubber would not be equally successful with those of other countries, unless it were the cost of transportation, which would naturally be more on account of the greater distance.

To introduce our merchandise into Egypt it is essentially necessary to be connected with some enterprising person who is willing to push things with perseverance.

I have been able to obtain the following price lists of an important Berlin manufacturer of India-rubber articles.

I am informed that a discount from 30 to 40 per cent, according to the importance of orders, is made on the prices given.

PRICE LISTS.

Tubes, with very strong linen folds, for sending water under pressure.

Interior diameter (English inches).	Price per meter. (The numbers below indicate the number of folds.)							Interior diameter (French millimeters).
	1	2	3	4	5	6	8	
$\frac{3}{8}$	$0.25	$0.36	$0.49	$0.62	$0.78	$0.94	$1.30	10
$\frac{1}{2}$	.31	.44	.59	.74	.91	1.09	1.49	13
$\frac{5}{8}$	.37	.51	.69	.86	1.05	1.25	1.69	16
$\frac{3}{4}$	.42	.60	.78	.97	1.19	1.40	1.89	19
$\frac{7}{8}$	.49	.67	.87	1.09	1.31	1.56	2.08	22
1	.55	.75	.98	1.21	1.45	1.71	2.28	26
$1\frac{1}{4}$	.69	.94	1.20	1.47	1.78	2.07	2.72	32
$1\frac{1}{2}$	.80	1.09	1.40	1.71	2.05	2.39	3.11	38
$1\frac{3}{4}$	.94	1.27	1.63	1.99	2.36	2.76	3.57	45
2	1.09	1.46	1.85	2.26	2.69	3.12	4.04	51
$2\frac{1}{4}$	.....	1.59	2.01	2.45	2.91	3.37	4.35	57
$2\frac{1}{2}$	.....	1.80	2.27	2.78	3.28	3.80	4.88	64
$2\frac{3}{4}$	.....	1.92	2.44	2.96	3.50	4.05	5.20	70
3	.....	2.10	2.60	3.16	3.74	4.38	5.52	76
$3\frac{1}{4}$	.....	.....	2.92	3.46	4.05	4.75	6.09	83
$3\frac{1}{2}$	.....	.....	3.09	3.75	4.41	5.10	6.76	89
4	.....	.....	3.41	4.14	4.87	5.62	7.16	102
$4\frac{1}{2}$	.....	.....	.....	4.73	5.56	6.41	8.14	114
5	.....	.....	.....	5.35	6.01	6.92	8.94	127
$5\frac{1}{2}$	.....	.....	.....	.....	6.70	7.71	9.76	140
6	.....	.....	.....	.....	7.15	8.22	10.41	152

The above-mentioned tubes are manufactured to order up to a length of 25 meters, and their prices are in proportion.

Suction tubes with an inside galvanised iron spiral.

Interior diameter (English inches).	Price per meter. (The numbers indicate the number of folds.)						Interior diameter (French millimeters).
	1	2	3	4	5	6	
⅜	$0.32	$0.42	$0.61	.....	.....	.....	10
½	.40	.52	.74	.....	.....	.....	13
⅝	.47	.61	.85	.....	.....	.....	16
¾	.54	.70	.97	$1.42	.....	.....	19
⅞	.64	.82	1.10	1.54	.....	.....	22
1	.72	.92	1.24	1.70	$2.22	$2.79	26
1¼	.90	1.16	1.52	2.06	2.66	3.31	32
1½	1.05	1.32	1.75	2.38	3.05	3.76	38
1⅝	1.32	1.64	2.11	2.85	3.60	4.40	45
2	1.47	1.84	2.40	3.19	4.04	4.92	51
2¼	.....	2.11	2.71	3.56	4.46	5.41	57
2½	.....	2.40	3.06	4.01	5.01	6.06	64
2¾	.....	2.56	3.29	4.29	5.34	6.45	70
3	.....	2.90	3.66	4.74	6.10	7.00	76
3¼	.....	.....	4.00	5.16	6.36	7.62	83
3½	.....	.....	4.35	5.60	6.89	8.22	89
4	.....	.....	4.80	6.17	7.59	9.05	102
4½	.....	.....	.....	6.97	8.56	10.21	114
5	.....	.....	.....	7.62	9.26	11.02	127
5½	.....	.....	.....	8.41	10.30	12.25	140
6	.....	.....	.....	8.97	10.99	13.06	152

The above-mentioned tubes are manufactured up to a length of 25 meters, and their prices are in proportion. The tubes with a plain exterior spiral pay 10 per cent in addition.

Garden hose.

Interior diameter.		Price per meter.	
Inches.	Millimeters.	With two folds.	With three folds.
⅜	10	$0.28	$0.34
½	13	.34	.40
⅝	16	.40	.46
¾	19	.46	.52
⅞	22	.52	.59
1	26	.59	.65
1¼	32	.71	.79

Tubes made of hemp lined inside with India rubber.

Interior diameter in millimeters.	Price per meter.		Interior diameter in millimeters.	Price per meter.	
	Black India rubber lining.	Red India rubber lining.		Black India rubber lining.	Red India rubber lining.
13	$0.50	$0.57	50	$1.12	$1.19
18	.54	.62	54	1.25	1.34
21	.60	.69	58	1.20	1.66
25	.66	.77	62	1.37	1.54
28	.75	.85	66	1.46	1.62
33	.80	.92	71	1.54	1.75
38	.92	1.00	75	1.60	1.87
42	.96	1.04	78	1.67	1.96
46	1.02	1.15			

The above tubes can be manufactured up to a length of 30 meters. They are lined with vulcanized India rubber, and they maintain their suppleness under all circumstances of employment and of temperature.

Tubes made of pure India rubber without linen envelopes for gas conduits, irrigating purposes, etc:

	Per meter.
White India rubber	$1.25
Red India rubber	2.92
Black patent India rubber	4.87

Tubes with linen folds and outside linen covering:

Simple, for locomotives and tenders	1.25
With iron spiral for steam under very high pressure	1.30

MISCELLANEOUS INDIA RUBBER MANUFACTURES.

India rubber in sheets for joints, lined or not, of whatever thickness, 20 meters long and from 1 to 1.25 meters wide:

Gray India rubber	.75
Red India rubber	1.45

India rubber sheets for manufacturing pump valves, 3.66 meters long and 1.22 meters wide:

For steam pumps—	
Dark gray India rubber	2.20
Black and proof against oil	2.50
For pumps for warm and cold water—	
Light gray	1.70
Red	3.37

India rubber straps with very strong cotton folds.

Width.		Price per meter. (The numbers below indicate the number of the folds.)						
English inches.	Millimeters.	2.	3.	4.	5.	6.	8.	10.
1	25	$0.27	$0.32	$0.36	.....	.....	.....	.....
1¼	32	.35	.41	.46	.....	.....	.....	.....
1½	38	.44	.52	.56	$0.65	.....	.....	.....
1¾	45	.50	.59	.65	.74	.....	.....	.....
2	51	.54	.65	.72	.82	$0.90	.....	.....
2¼	57	.59	.69	.79	.89	1.01	.....	.....
2½	64	.65	.76	.87	.99	1.14	.....	.....
2¾	70	.70	.82	.95	1.06	1.22	.....	.....
3	76	.75	.89	1.01	1.15	1.31	.....	.....
3¼	83	.82	.97	1.12	1.25	1.46	.....	.....
3½	89	90	1.06	1.21	1.37	1.57	.....	.....
3¾	95	.95	1.11	1.29	1.45	1.66	.....	.....
4	102	1.00	1.17	1.35	1.52	1.75	$2.15	.....
4½	114	.....	1.35	1.55	1.75	2.01	2.45	.....
5	127	.....	1.50	1.72	1.96	2.25	2.74	.....
5½	140	.....	1.65	1.89	2.14	2.45	2.98	.....
6	153	.....	1.85	2.12	2.41	2.69	3.25	$3.75
7	178	.....	2.15	2.46	2.81	3.10	3.75	4.45
8	203	.....	2.50	2.86	3.25	3.55	4.25	5.13
9	228	.....	2.77	3.12	3.58	4	4.75	5.85
10	254	.....	3.07	3.50	4.00	4.45	5.25	6.55
11	279	.....	3.36	3.85	4.43	4.90	5.75	7.25
12	305	.....	3.70	4.20	4.85	5.35	6.25	7.95
14	355	.....	4.25	4.90	5.70	6.25	7.25	9.35
16	406	.....	4.90	5.60	6.55	7.15	8.25	10.75
18	457	.....	5.50	6.30	7.40	8.05	9.25	12.15
20	508	.....	6.37	7	8.25	8.95	10.25	13.50

The following statement shows the prices on the Liverpool market of rubber imported from different parts of Africa (taken from an African produce price list dated April 17, 1890):

	Per pound.			Per pound.	
Congo ball	$0.44½	to $0.47	Liberian	$0.36½	to $0.41½
Gaboon ball	.39	.41	Acera	.24	.55
Small tongue	.34	.38	Axim and Assinee		.47
Bold tongue	.40	.43	Cameroons ball	.45	.46
Ileke	.32	.36	Old Calabar	.40½	.42
Small ball	.34	.36	Sierra Leone niggers	.46	.51
Thimbles	.45	.47	Gambia niggers	.43	.56
Cape Coast and Salt Pond	.38	.44			

LOUIS B. GRANT,
Acting Consul-General.

UNITED STATES CONSULATE-GENERAL,
Cairo, February 13, 1891.

Madeira.—India rubber is not a product of my district. It is not manufactured here in any character. The climate will not permit of its use for clothing. Beyond hose for water purposes and belting for machinery, India rubber is not in use here.—(Thomas C. Jones, consul, Funchal, November 4, 1890.

AUSTRALASIA.

NEW ZEALAND.

REPORT BY CONSUL CONNOLLY, OF AUCKLAND.

India rubber is not produced or manufactured in New Zealand. The greater part of all the rubber goods imported into this country is manufactured in England, a small proportion only coming from the United States and the Australian colonies. The value of rubber imports during 1889 amounted to $25,870, viz:

Great Britain	$23,650
United States	1,545
Victoria (Australia)	290
New South Wales (Australia)	385
Total	25,870

There is a duty of 20 per cent ad valorem on all kinds of rubber goods, with the exception of the following articles, which are allowed to enter free, viz: India-rubber sheet for engine packing, as N. O. E.; India-rubber soles for tennis shoes, and rubber or gum boots.

The quantity or quality of the goods can not be ascertained; the value and country whence imported are alone available. The dutiable rubber goods imported from the United Kingdom in 1889 amounted to $3,200, and from the United States to $460. India rubber from the undermentioned countries was admitted duty free.

Great Britain	$20,450
United States	1,085
Victoria	290
New South Wales	385
	22,210

I am, however, inclined to believe that the articles coming from Victoria and New South Wales were manufactured in England.

New Zealand importing merchants readily admit that American rubber goods are more durable, much lighter, and give better general satisfaction than the English manufactured article. The reasons given why importers purchase so largely from the British manufacturers are that they (the importers) have always been in the habit of doing so and that their customers appear to be fully satisfied with the British article.

Another reason is that the American manufacturers have not made any effort to introduce their goods into this colony. As to the best methods for introducing American India-rubber manufactures, it is difficult to intelligently advise. This being a British colony, the people are, therefore, fully imbued with that conservatism which is a striking characteristic of the British race. They are slow to accept any innovation on long-established principles, whether they be religious, political, or commercial. I will not say there is a prejudice against American merchandise, but that there is, however, a decided and unmistakable preference for English wares there can be no doubt. The American manufactures that have been successfully introduced into this market are, in nearly every instance, far superior to the British article; otherwise the position could not be maintained. There is an almost insuperable desire on the part of the people to cultivate even closer trade relations with the home country than at present exists.

In proof of this it is only necessary to call attention to the fact that the principal imports from the United States to this colony are such as can not be produced in Great Britain as cheaply. Kerosene, tobacco, canned fruit, and fish constitute the chief articles of commerce between New Zealand and the United States. I may also mention that our mining and agricultural machinery, particularly the latter, is daily gaining in public appreciation.

To favorably introduce American manufactures which would come in direct competition with the manufactures of the United Kingdom requires time and perseverance. The inhabitants, though conservative and in some instances very slow to dispense with old and tried articles of merchandise, yet tenaciously maintain their hold upon new brands when once established in their confidence. Notwithstanding the evident preference given English interests, still, owing to the undoubted superiority of many of our manufactures, there is a boundless field for enterprise and commercial conquest in these vigorous and growing colonies. Success in this respect is, however, wholly dependent on the energy and efforts of our manufacturers and exporters.

First, it is necessary to offer greater encouragement to our shipping interests and establish more frequent communication between these colonies and the United States.

Second, the cultivation of closer commercial intercourse, together with a more thorough knowledge of the requirements of the people. The latter, in my judgment, is imperatively necessary to insure success.

Third, as no man is more capable of acquiring the most necessary information than one who is thoroughly familiar with the details of the trade, I would therefore suggest that the India-rubber manufacturers, either individually or collectively, select a practical man in whom they have confidence, supply him with samples, and send him forth to represent them. It is possible he may not succeed the first time, but, if he is an observant man, he will be able to present his employers with

all the necessary particulars, especially with reference to the demand, price, class, and quality of goods most adapted to the requirements of the Australasian market.

If the American manufacturers have not the necessary goods in stock, they may find it profitable to enter upon the manufacture of the particular class of goods required, and thus open up a new field for their wares, and, perhaps, successfully compete with those who monopolize the India-rubber markets of Australasia at present. In any event, by sending out a competent man the manufacturers will be placed in a position to determine whether they would be able to compete for a greater portion of this trade. Should the India rubber interests conclude the expense of sending an agent to these colonies would be too great, in that case I would respectfully suggest that two or more industries combine and send a competent representative, the expenses to be equally divided among all concerned.

In a word, exporters, manufacturers, and merchants ought to and must do more than procure incomplete consular reports if they would extend their trade with foreign countries. I know of no better way to do this than to commission able, practical business men who can faithfully represent their interests abroad.

JNO. D. CONNOLLY,
Consul.

UNITED STATES CONSULATE,
Auckland, New Zealand, November 29, 1890.

QUEENSLAND.

REPORT BY CONSULAR AGENT HARRIS, OF BRISBANE.

Some thousands of trees were planted at Mourilyan Harbor, North Queensland, and did, I am informed, remarkably well, and the rubber that was taken from them was valued at a good average marketable price, but before it could be got in any quantity the hurricane of last year so destroyed the place that it was abandoned. I hear, however, that since that time many of the trees have recovered from the effects of that tornado and it is possible cultivation may again be resumed.

Return showing the quantity and value of India rubber and India-rubber goods imported into Queensland during the years 1889 and 1890:

India rubber.

From—	1889.		1890.	
	Pkgs.	Value.	Pkgs.	Value.
Great Britain	8	£427=$2,078.00	9	£163= $793.24
New South Wales	9	75= 364.99	13	125= 608.31
Victoria	3	87= 423.38	2	8= 38.93
Total	20	589= 2,866.37	24	296=1,440.48

India-rubber goods.

From—	1889.		1890.	
	Pkgs.	Value.	Pkgs.	Value.
Great Britain	134	£3,543=$17,242.01	79	£1,731=$8,443.91
New South Wales	174	1,516= 7,377.61	148	1,427= 6,964.50
Victoria	44	322= 1,567.01	9	58= 282.26
France			1	59= 287.12
Germany	7	207= 1,007.36	11	154= 749.44
United States	13	98= 476.92	12	56= 272.52
Total	372	5,686= 27,670.91	260	3,485=16,979.75

GEORGE HARRIS,
Consular Agent.

UNITED STATES CONSULAR AGENCY,
Brisbane, March 11, 1891.

HAWAII.

India rubber is not a product of this kingdom.

The rubber tree is not indigenous, but thrives well in this climate and is cultivated only for shade and for ornament.

There is no rubber gathering in these islands and no capital engaged in its manufacture.

This tree can be cultivated in Hawaii, but it would hardly prove profitable compared with other established products, such as sugar cane, rice and coffee.

From the customs imports for 1889 at Honolulu I extract the following statistics of imports:

Free by treaty:	
61½ dozen rubber boots, 24 pairs rubber boots	$214.90
723 pairs boots and shoes	511.96
1 bale billing	33.28
Dutiable:	
34⅛ dozen coats, 2 dozen suits	715 31
124 feet rubber tubing	9.60
46,151 feet rubber hose, 3 coils rubber hose, 1 jack rubber hose	7,271.60
Add to the above for value of imports at Hilo, Mahukona, and Kahului, say	2,000.00
Total valuation of	10,756.65

The duty on all rubber goods not embraced in the treaty schedule is 10 per cent ad valorem. American goods are principally used, but the trade is limited to the foreign population.

H. W. SEVERANCE,
Consul-General.

UNITED STATES CONSULATE-GENERAL,
Honolulu, November 20, 1890.

MOROCCO.

REPORT BY CONSUL-GENERAL MATHEWS, OF TANGIER.

Morocco produces no caoutchouc, or India rubber. There are no manufactures whatever of this article in this country, and rubber goods are not used by the native population. The few rubber goods used by the foreign residents are procured at Gibraltar.

Should rubber goods be imported in to Morocco, the usual duty on all imports would be imposed, viz, 10 per centum ad valorem.

FELIX A. MATHEWS,
Consul-General.

UNITED STATES CONSULATE-GENERAL,
Tangier, November 14, 1890.

INDEX TO SPECIAL CONSULAR REPORTS, VOL. VI.

[1. Coal and Coal Consumption in Spanish America. 2. Gas in Foreign Countries. 3. India Rubber.]

1. COAL AND COAL CONSUMPTION IN SPANISH AMERICA.

[The reports herewith indexed cover the following interrogatories: Whence coal consumed in respective districts is obtained; the amount and kind consumed; the price and ports of delivery; the manner in which business is conducted and by whom, stating the nationality and class of vessels engaged therein, together with such other statistics as may aid American producers to determine as to their ability to enter more largely into the trade; the ascertained and probable extent and value of local coal fields.]

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2. Name of gas company.
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4. Process of manufacture.
5. Candle-power of gas.
6. Approximate annual output.
7. Number of consumers.
8. Price of gas per 1,000 cubic feet.
9. The use of gas stoves for heating and cooking.
10. Wages of employés and hours of labor.
11. Material used in the manufacture of gas, where obtained, and price at the gas-works.

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3. INDIA RUBBER.

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